

AA AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

FEBRUARY 15, 1957

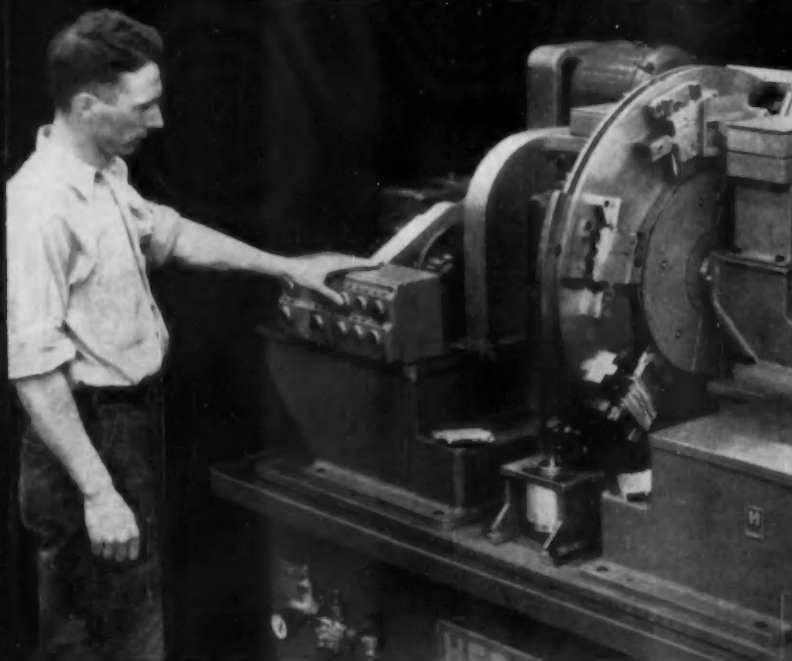
In This Issue

Details of Bendix Electronic Fuel Injection System
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A C H I L T O N P U B L I C A T I O N

LET'S FACE IT!



This special Heald Bore-Matic, with 12-station trunnion type fixture, is designed for precision facing of aluminum automatic transmission valve bodies. Two parts precision faced simultaneously on opposite sides of the fixture. The fixture rotates at approximately $\frac{1}{2}$ rpm and finished parts are unloaded and new parts loaded manually during a 60 degree segment of fixture rotation. With stock removal of .05 inch over the face area and a surface finish of 20 microns or better, this "ferris wheel" Bore-Matic maintains a continuous production of 270 parts per hour at 75% efficiency.

Heald "Ferris Wheel" Bore-Matics put precision facing on a non-stop, high production basis . . . with loading and unloading "on the fly"

WHEN it comes to precision facing, Heald Borizing, with a "ferris wheel" type fixture, meets the most exacting requirements for both high production and high precision.

Designed for continuous operation, with non-stop loading and unloading, a multi-station rotating trunnion-type fixture carries the parts between two opposed boringheads which perform simultaneous facing operations on both sides of the fixture.

The loading and unloading are done while the fixture is rotating at a constant speed and can be accomplished easily by manual operation as in the photo above. A foot operated hydraulic clamping control leaves both hands free for this operation.

This specialized precision facing machine illustrates the extreme flexibility of Bore-Matic design and the ability of Heald engineering to solve your precision finishing problems with the most advanced production methods.



IT PAYS TO COME TO HEALD!

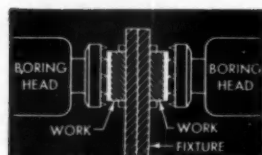
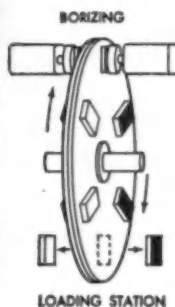
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Subsidiary of The Cincinnati Milling Machine Co.

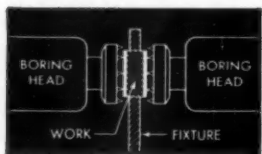
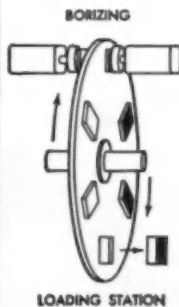
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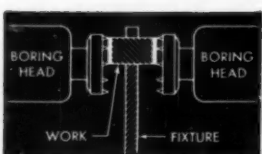
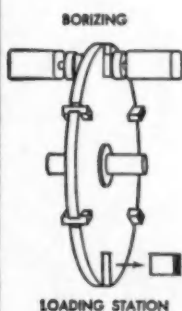
Heald "ferris wheel" Borizing is adaptable to a wide variety of precision facing operations.



FACING ONE SIDE OF TWO PARTS SIMULTANEOUSLY

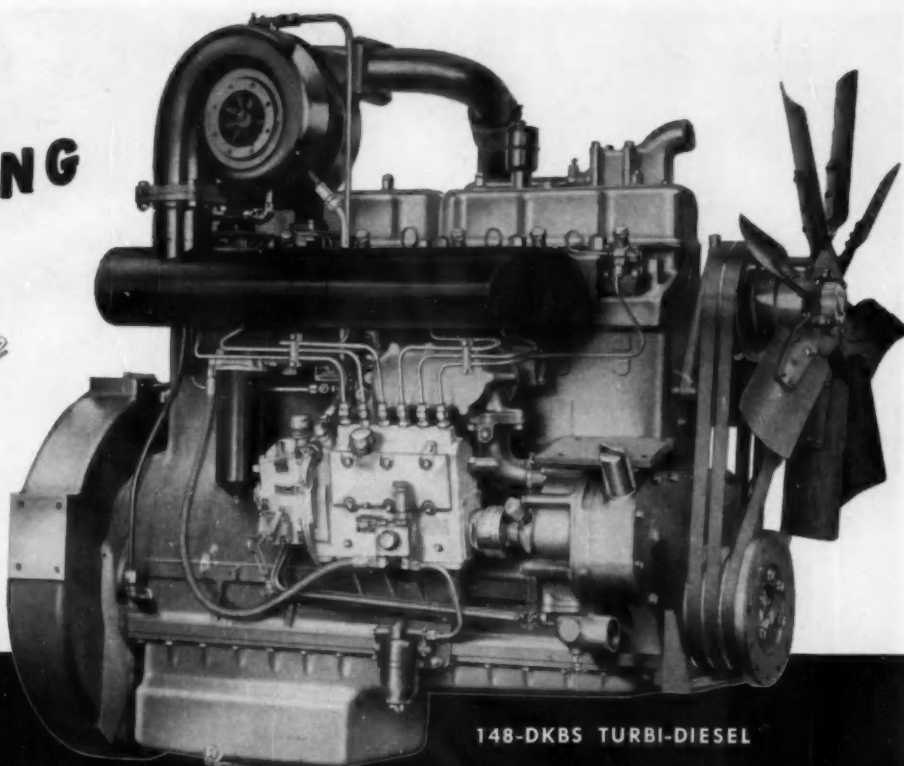


FACING BOTH SIDES OF ONE PART SIMULTANEOUSLY

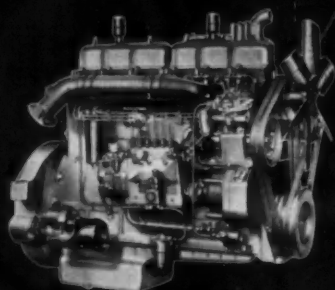


FACING BOTH ENDS OF ONE PART SIMULTANEOUSLY

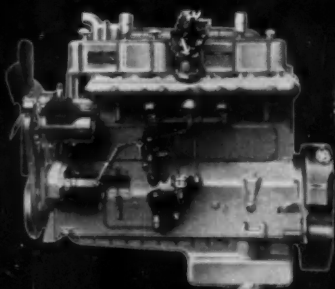
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Nickel alloy that boosts life of her jets
may boost performance of gas turbine parts

Lockheed's new Starfighter climbs as fast as she flies ... hurled into the sky by her J-79.

That calls for operation at high temperature ... a problem designers solved with Incoloy "T" titanium-containing nickel-iron-chromium alloy.

Incoloy "T" alloy gives combustion liners the desired life expectancy. Its performance suggests that it may have interesting possibilities for parts in new automotive systems.

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resistance and excellent physicals at temperatures up to 1,600°F. What's more, its nickel content is relatively low. You'll find more details in "Basic Data on Incoloy 'T' Alloy", available from Inco.

Maybe Incoloy "T" or one of the many other Inco Nickel Alloys can help on your problem. Inco's Mechanical Engineering Section will be glad to talk it over. Let's get together soon.

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and electronic gear. Pri-
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element in other materials.
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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

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VOL. 116, NO. 4

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AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 29, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 29. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, United States Possessions, 1 year \$2.00, 2 years \$3.00. Canadian and Foreign, 1 year \$5.00, 2 years \$8.00. Statistical Issue (Mar. 15th), \$1.00

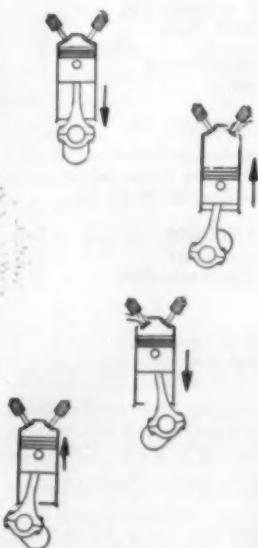
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peak performance longer*



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44,291

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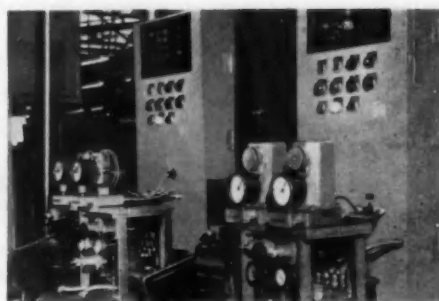
TIMING CHAIN AND SPROCKETS

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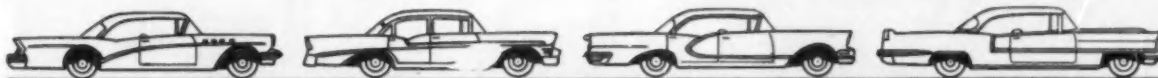
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A copy for every designer



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Seal Sizes and Types—by Numerical Listing
Metal-Encased Felt Seal Listing

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You'll quickly see this is not just the usual reference catalog that tells you what you can have. Instead, this new, modern edition shows and tells you how to get the oil seal you need—and how to insure effective performance.

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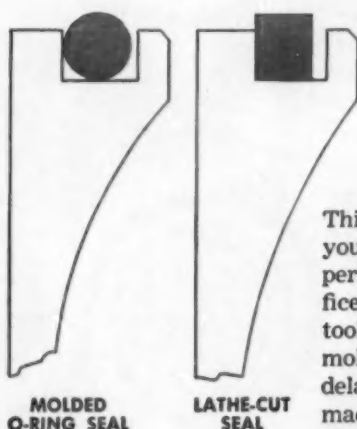
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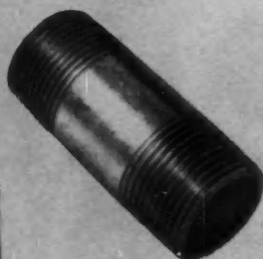


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New Sunicut 5534 is a non-emulsifying, transparent cutting oil specially compounded to give above-average machining results to operators who want a single oil to machine a large variety of ferrous metals.

Tests have proved that new Sunicut 5534 meets this demand for an all-purpose cutting oil. It is ideal for general screw machine and turret lathe work. It is also excellent for tapping, drilling, threading, and light stamping operations. In addition, new Sunicut 5534 can be used on many special machining jobs, both high and low speed, with metals ranging from B1112 to 4130 as well as free-machining stainless steels.

For complete information about new Sunicut 5534 and how it can help you reduce your oil inventories...lower your production costs...see your Sun representative. Or write **SUN OIL COMPANY**, Phila. 3, Pa., Dept. AA-2.

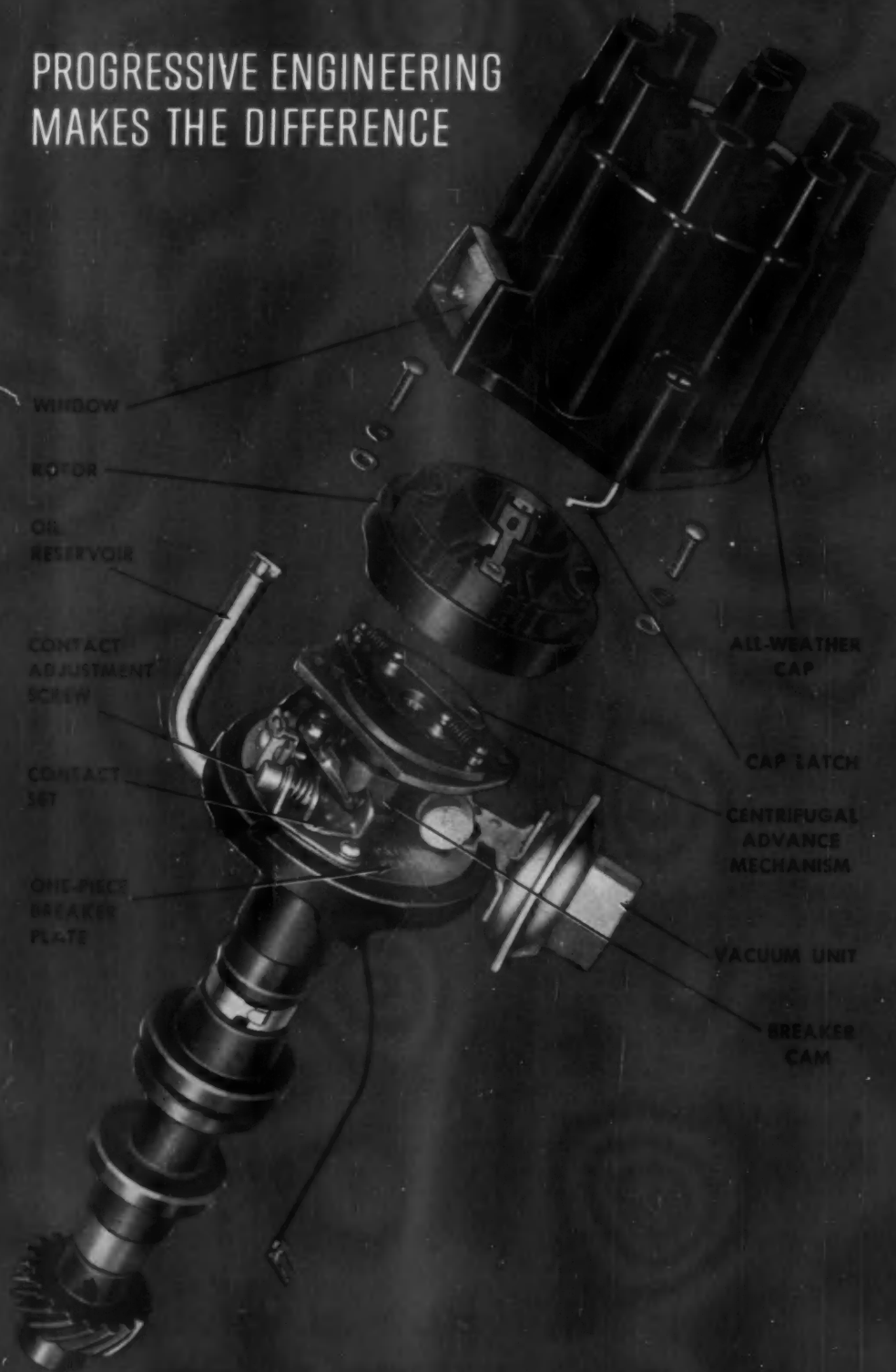


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PROGRESSIVE ENGINEERING MAKES THE DIFFERENCE



NEW DELCO-REMY EXTERNAL ADJUSTMENT DISTRIBUTOR ON ALL GM CARS IN 1957

Designed especially for *present* and *future* high-compression engines, Delco-Remy's trend-setting new external adjustment distributor increases timing accuracy, provides greater electrical efficiency and durability combined with unprecedented ease of servicing.

Contact point opening (and hence cam angle) is adjustable through a "window" in the cap *while the engine is running*. No special tool is required—just a simple "hex" wrench. The contact point set is a unit completely assembled and adjusted before being attached to the breaker plate . . . is easy to replace, in servicing, with a new factory-adjusted set, simply by removing two attaching screws.

Centrifugal advance components have been relocated to a position *above* the circuit breaker mechanism, making it possible to locate the high-rate-of-break cam and the high speed breaker lever directly adjacent to the main bearing, for maximum rotational stability. The new one-piece circuit breaker plate rotates about the upper main bearing on a precision-fit bearing surface concentric with the shaft. Because of this new low-friction, concentric-rotating breaker plate, vacuum advance performance and hence fuel economy are improved.

The new all-weather cap is easy to remove and replace—even in crowded underhood areas—by simply turning the spring loaded latches with a screwdriver. Removal of the cap completely exposes the entire distributor mechanism for easy access.

This all-new design is the original equipment distributor on all General Motors cars for '57 and is another example of Delco-Remy leadership "Wherever Wheels Turn or Propellers Spin."

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA



GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

ELECTRICAL SYSTEMS

Bundyweld Tubing guides and guards



Above, six-way power seat on the 1957 DeSoto.

In 1957 Imperials, Chryslers, De Sotos, and Dodges, fingertip pressure on the master switch sends Ferro's new power seat adjuster into action. Solenoids engage the proper selective drive; rotating cables transmit torque from electric motor to synchronized slave units in each track. Seat moves up, down, forward, backward; tilts up and forward, down and backward.

BUNDYWELD IS DOUBLE-WALLED FROM A SINGLE STRIP



Bundyweld starts as a single strip of copper-coated steel. Then it's . . .



continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Copper coating fuses with steel. Result . . .



Bundyweld, double-walled and brazed through 360° of wall contact.



NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

SIZES UP TO 1/2" O.D.

"muscles" of new 6-way power seat

Ferro Stamping uses strong, versatile Bundyweld Tubing in seat adjusters for Chrysler Corporation's 1957 cars

Long, sleek and low, Chrysler Corporation's 1957 automobiles demand more compact power accessories. Ferro Stamping Company has solved one such problem with this revolutionary new electromechanical 6-way power seat adjuster.

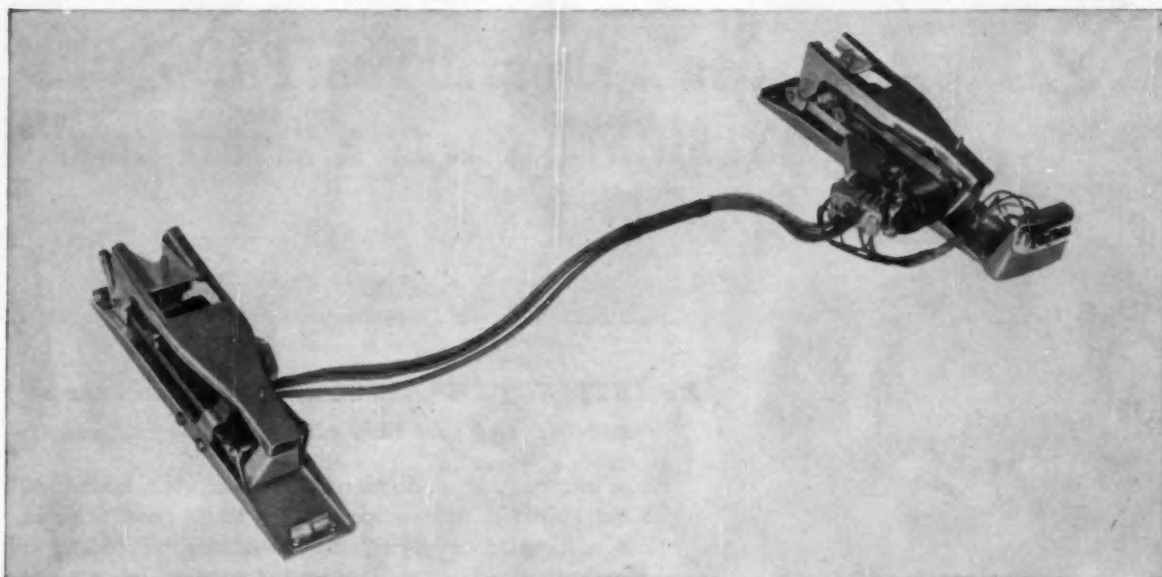
From an electric motor, flexible cables drive slave units through torque tubes that must be: *smooth*, to protect cables from fraying; *rigid*, for years of dependable operation; *easily fabricated* to exact lengths; and *economical*. When other means failed to meet these high standards, Ferro engineers turned to Bundyweld® Tubing.

Versatile Bundyweld is the only tubing double-

walled from a single metal strip, then copper-bonded through 360° of wall contact. Bundyweld is smooth, strong, and lightweight. Ductile and easily fabricated, it has high bursting and tensile strength; is extremely resistant to vibration fatigue. That's why *Bundyweld is used on 95% of today's cars, in an average of 20 applications each!*

From Bundy® you get tubing fabricated to your exact specifications, properly packaged, and delivered right on schedule. And Bundy offers expert, free engineering service, too. For mechanical and fluid transmission applications on cars, trucks, and farm equipment, it will pay you to check first with Bundy. Call, write, or wire us today!

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN

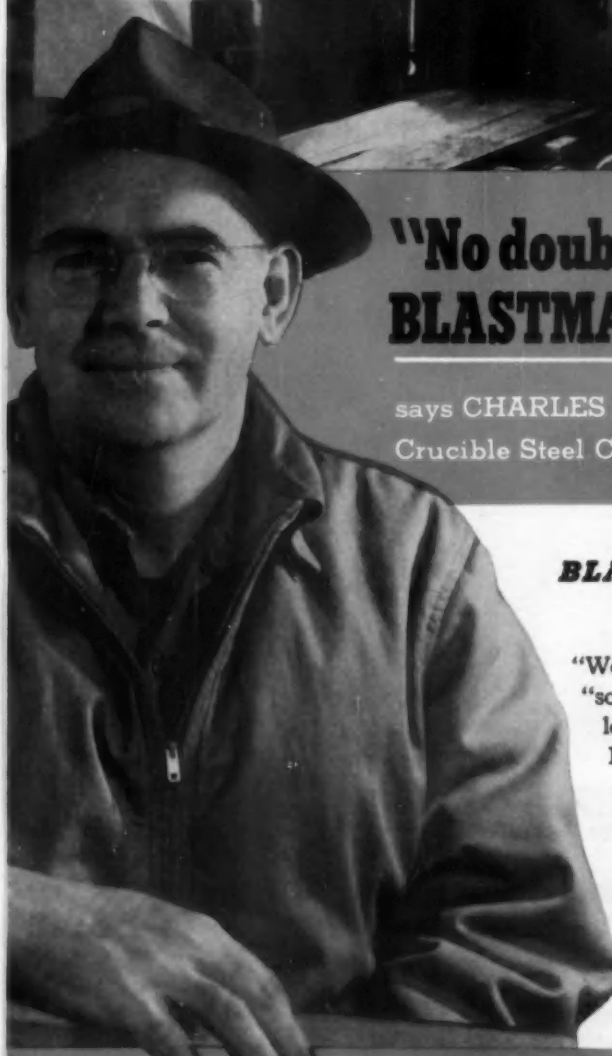


Six lengths of strong, lightweight Bundyweld Tubing guide and protect the drive cables of this power seat unit manufactured by the Ferro Stamping Company, Detroit, Michigan. Slave units are inter-coupled to form an unbroken, permanently synchronized drive to both sides of the seat.

BUNDYWELD® TUBING

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • Chattanooga 2, Tenn.: Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • Chicago 32, Ill.: Lapham-Hickey Co., 3333 W. 47th Place • Elizabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 • Los Angeles 58, Calif.: Tubesales, 5400 Alcoa Ave. • Philadelphia 3, Penn.: Rutan & Co., 1717 Sanson St. • San Francisco 10, Calif.: Pacific Metals Co., Ltd., 3100 19th St. • Seattle 4, Wash.: Eagle Metals Co., 4755 First Ave., South Toronto 5, Ontario, Canada: Alloy Metal Sales, Ltd., 181 Fleet St., E. • Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.

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says CHARLES BACHMAN, Plant Engineer,
Crucible Steel Casting Co., Lansdowne, Pa.

***BLASTMASTER® has eliminated need for a
second shift in this cleaning department.***

"We're interested in production figures," says Mr. Bachman, "so our blast cleaning equipment has to do good work at low cost. After studying the situation, we picked a Pangborn Blastmaster. It does the kind of job we like and its features are everything they're expected to be!"

If you need blast cleaning equipment, look at all makes. Then check the Pangborn Blastmaster. It offers many exclusive features plus a choice of sizes to fit your needs—1½, 3, 6, 12, 18 and 27 cu. ft. Write for Bulletin 225 to PANGBORN CORPORATION, 3900 Pangborn Boulevard, Hagerstown, Maryland.

Pangborn blast cleans cheaper

HY-PRO specialized tap engineering tells you which tap where for lowest cost per hole

New alloys, new plastics, new tooling set-ups, and mounting production demands pose new problems daily in tap selection and use. HY-PRO tap engineering service provides prompt answers . . . the *right* answers that mean steady savings in tap expense, in time loss on the line, in reduced parts spoilage.

In plastics



Abrasive composition of most hard plastics requires Hy-Pro's multi-fluted design, .0025 oversize, with the exclusive Hy-Pro "Hardernell" finish for maximum wear resistance and free-cutting.

In die castings



Relative softness of alloys used causes tendency to close in and bind the tap. Hy-Pro's 2 flute spiral point oversize design meets these conditions, — provides free-tapping, clean threads.

In stainless steel

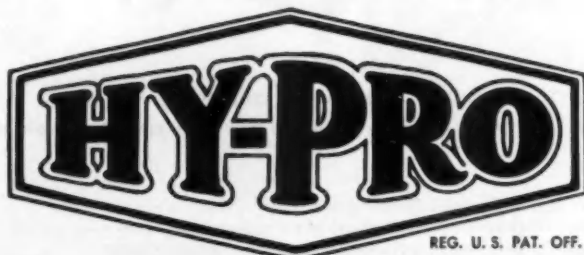


Hy-Pro spiral point design provides high-hook angle for most efficient cutting of this metal, and maximum tap strength. Ferrox surface treatment counteracts chip welding.

In aluminum



Hy-Pro's spiral (1) flute tap lifts chips out, gives best results in blind holes. Hy-Pro's spiral point design (2) is recommended for through holes. Chrome plate or nitride surface treatment resists abrasive effect of most aluminum alloys.



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TAP ENGINEERING SPECIALISTS

HY-PRO TOOL COMPANY • NEW BEDFORD, MASS., U. S. A.

What's your tapping problem?

Hy-Pro Tap Engineering Specialists can help you correct tapping troubles — and can often point out opportunities to cut costs in tapping operations you've considered satisfactory. It costs nothing to consult Hy-Pro Specialists, and records prove that in 8 out of 10 cases, their advice will pay steady dividends in savings. Write or phone: Hy-Pro Tool Company, Dept. A, New Bedford, Mass.

**CALL YOUR LOCAL HY-PRO DISTRIBUTOR
FOR STANDARD TAPS FROM STOCK
SPECIAL TAPS MADE TO ORDER**



With National Seals

Quality control isn't a myth— it's a crusade!

At National, quality control is based on the oil seal industry's most rigid manufacturing specifications. It begins with critical examination of raw materials. It includes constant checking of form tools and molds. It extends to exhaustive optical examination of all seal components by an exclusive process developed at National. (In this process, seals are cast and cross-sectioned, and an optical comparator used to show exact shape and position of every seal part, mounted on the shaft or unmounted.) And always, there are extensive and continuing operating and "leak" tests of finished seals.

For proved dependability, specify National seals. And for prompt, knowledgeable help on sealing problems, call your factory-trained National Seal engineer.

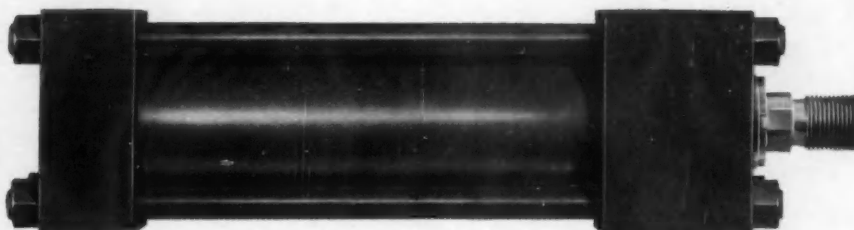


NATIONAL SEAL Division, Federal-Mogul-Bower Bearings, Inc.

General Offices: Redwood City, California; Plants: Van Wert, Ohio, Downey and Redwood City, California

National Field Engineers At Your Service: Chicago, Ill., Room 462, McCormick Building, HArrison 7-5163
Cleveland, Ohio, 210 Heights Rockefeller Bldg., YEllowstone 2-2720 • Dallas, Texas, 2520 West Mockingbird Lane, FLettwood 2-7541
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4000



designed for leadership!

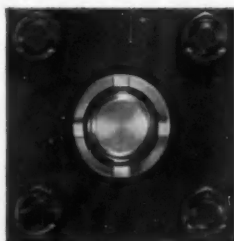
The superiority of Hannifin cylinders begins on the drawing board, where Hannifin designers have originated feature after feature not found in other air and hydraulic cylinders. But it doesn't end there...

Hannifin offers more kinds of cylinders, more sizes, more mounting styles. Each manufactured with such exacting con-

trol of dimensions and finishes that it not only looks like a better cylinder—its performance proves it!

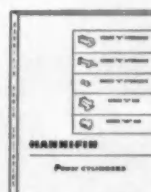
As more and more discriminating specifiers and buyers are finding, the extra quality you get from Hannifin costs you no more, can usually be delivered sooner.

Why not specify Hannifin by name when you buy?

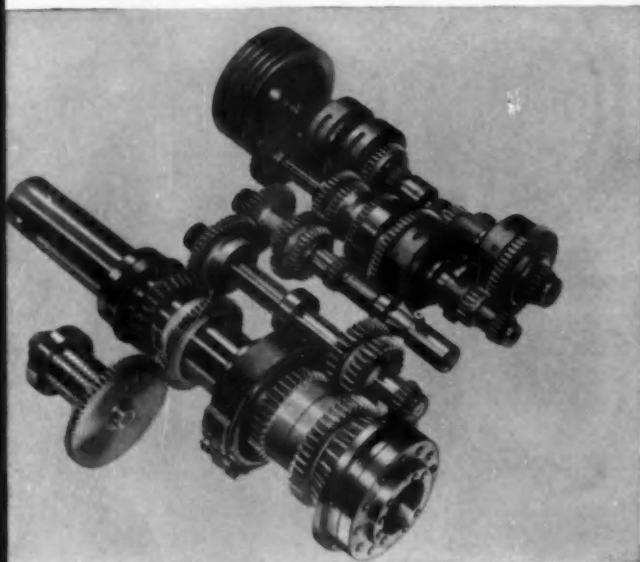


AIR AND HYDRAULIC
HANNIFIN
 POWER CYLINDERS

Write for your copy of this new Hannifin Cylinder File—complete, easy-to-use, easy-to-order-from information on five lines of Hannifin cylinders. Hannifin Corporation, 543 South Wolf Road, Des Plaines, Illinois.



WANT MORE POWER, MORE SPEEDS?

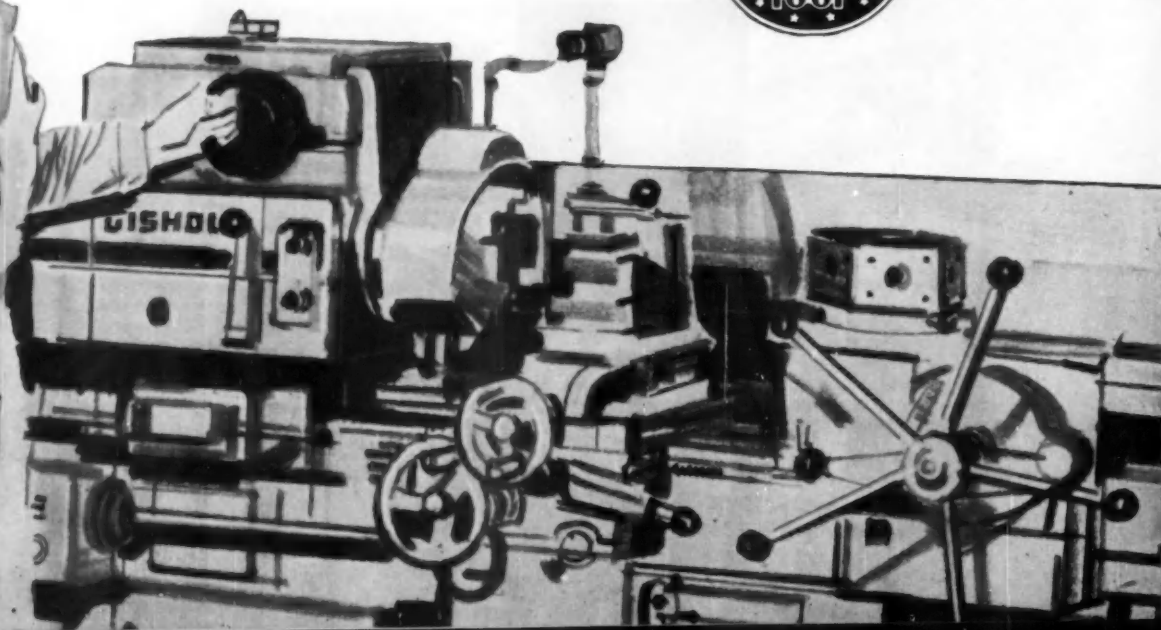


NEW HEADSTOCK GEAR TRAIN—sixteen different spindle speeds available, powered by up to 30 h.p. single-speed driving motor delivering full power at all speeds. Spindle is mounted on selected pre-loaded, precision-tapered roller bearings. Heavier, more rugged design provides smoother, quieter power.

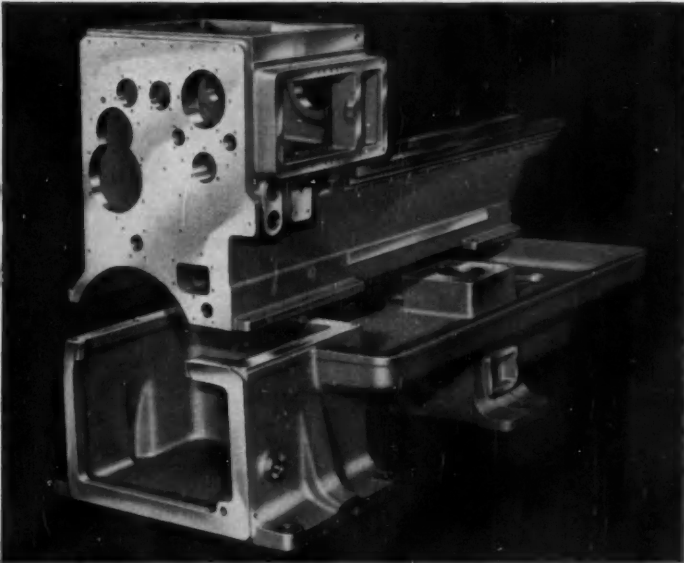


HYDRAULIC SPEED SELECTOR—smooth, effortless speed changes. No waiting, no computing, no stopping of spindle, no releasing of main drive clutch. Operates direct or pre-set. Hi-Lo Lever permits instantaneous speed changes in 8:1 ratio without moving Speed Selector handwheel. Multiple Disc Clutches have automatic take-up for wear.

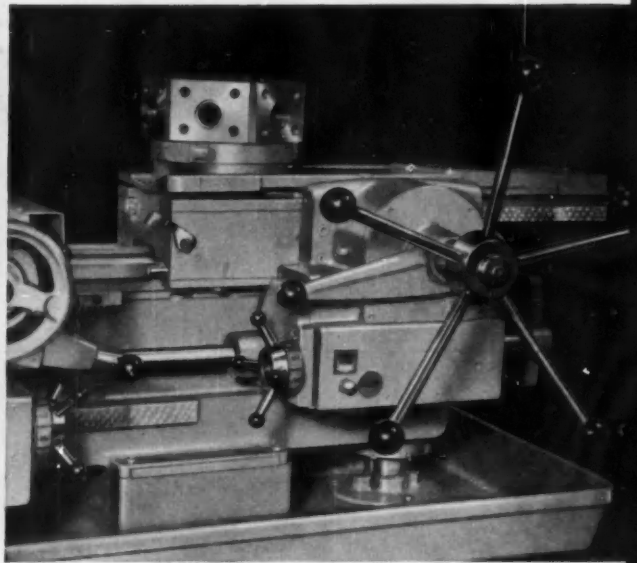
YOU GET THEM ALL...PLUS NEW GISHOLT MASTERLINE



WANT HEAVY CUTS WITHOUT VIBRATION?



NEW HEADSTOCK AND BED CASTING—scientific design dampens out vibrations, assures smooth operation and simplifies holding closer tolerances. Made from semi-steel, poured in Gisholt's own foundry. Greater swing over ways permits bigger chucks and broader range of workpiece sizes. Provides a solid foundation for all types of work.



NEW TURRET RAM AND SADDLE—designed wider, heavier, more rigid to handle increased capacity and higher speeds. Dial-type feed selector makes feed changes faster, easier. Turret ram rigidly supported on 64-66 Rockwell C alloy steel way strips. Power transmitted through serrated tooth clutches, with shear pin protection against overloading.

GREATER VERSATILITY...WITH THE RAM TYPE TURRET LATHE

YOU'LL SPEED UP your production jobs—both large and small—with this more powerful, more versatile Gisholt MASTERLINE Ram Type Turret Lathe.

Here is a machine designed from end-to-end for easier setups, faster change-over and higher productive output than ever before. Check the advanced features illustrated above. Note the reserve power to handle your heaviest cuts—and to meet your tooling requirements of tomorrow. Note the extra spindle speeds—all at your operator's finger tips, without computing—for faster, better turning of

any type material. And look over the new massive design, the over-all ruggedness that permits greater accuracy, closer tolerances, deeper cuts at punishing feeds without vibration.

Find out now how this powerful, flexible Gisholt MASTERLINE Ram Type Turret Lathe can reduce floor-to-floor time on your specific jobs. Call your Gisholt Representative today—let him show you how this advanced machine can fit most profitably into your production picture. Or write direct to Gisholt for the new literature described below.

READY NOW—all-new, 18-page illustrated Bulletin No. 1174-B, covering features, accessories, tools and floor plans on new Gisholt MASTERLINE Ram Type Turret Lathes. Ask for it!



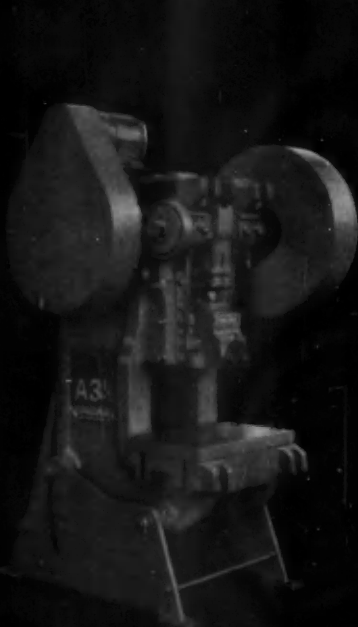
GISHOLT

MACHINE COMPANY

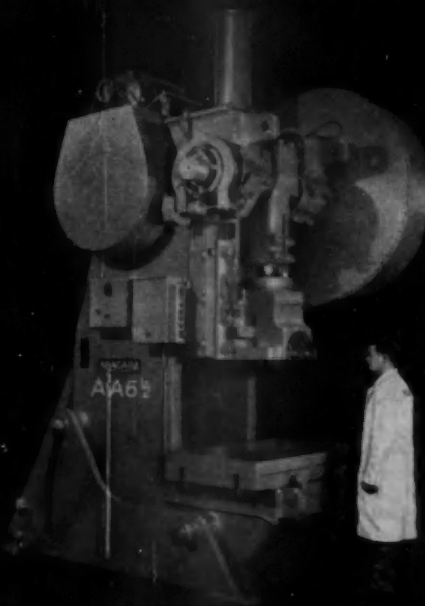
Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

NIAGARA HAS THEM!



SERIES A, 5 1/2-110 tons

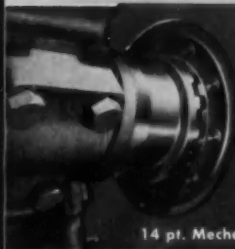


SERIES AA, 32-200 tons



SERIES E, 75-200 tons
Front-to-Back Crankshaft

READILY EQUIPPED TO HANDLE



14 pt. Mechanical Sleeve



18 pt. Electro-Pneumatic Sleeve



Electro-Pneumatic Friction



Single Cylinder



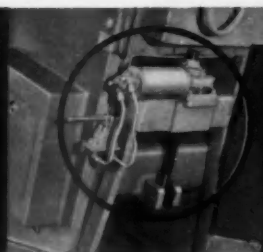
Tandem Type

THREE TYPES OF CLUTCHES

Each Niagara Incliner features the clutch best suited for the purpose. (1) Famed Niagara multi-jaw mechanical sleeve clutch. (2) Exclusive Niagara multi-jaw Electro-Pneumatic sleeve clutch. (3) Niagara low inertia Electro-Pneumatic friction clutch.

FOUR TYPES OF DIE CUSHIONS

Designed and manufactured by Niagara, single cylinder and tandem type pneumatic die cushions are built in 4 types to make any Niagara Incliner a double action press. Self-lubricating models are available for automated OBI's.



POWER INCLINING DEVICE

Fast-acting, safe and easy to operate, Niagara's air motor inclining device (shown above) is furnished as an optional accessory.

EQUIPPED FOR AUTOMATION

Featuring the most advanced controls and devices, Series EA (automated models) are engineered for peak productive capacity. Here's a line of OBI's that is completely equipped by Niagara for operation in your automation lines.

SPECIAL BOLSTER PLATES
J.I.C. CONTROLS FLANGED SLIDES
POWER SLIDE ADJUSTMENT
FLYWHEEL BRAKE
DIE AREA LIGHTING
MOTOR CUTOUT SWITCH

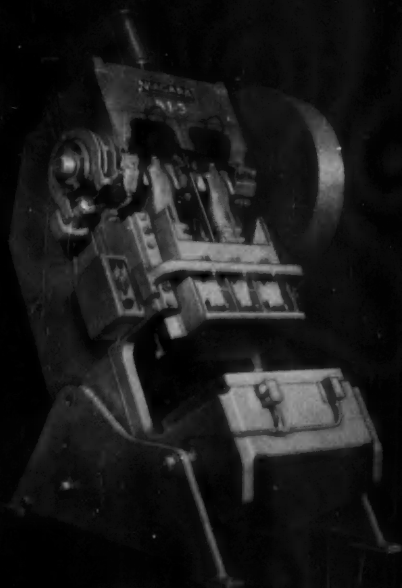
WIDE CHOICE OF ACCESSORIES

With a full selection of modern press accessories available, Niagara Standard Incliner are adaptable to the widest possible range of job assignments.

standard OBI presses in all sizes and types that are right for you!



SERIES EA (Automated), 75-200 tons
Front-to-Back Crankshaft



SERIES BI, 60-200 tons
Double Crank

5 LINES . . . 34 MODELS
EACH A CHAMPION IN ITS CLASS

Niagara offers you industry's most complete, most modern, and most exclusive selection of standard inclinables . . . plus an unequalled choice of press accessories and automatic devices to meet your specific job requirements. You can count on Niagara for inclinables that will do the most to speed production, assure accuracy, prolong die life and hold down maintenance costs within your plant.

YOUR WORK MOST PROFITABLY



Manual



Automatic



Automatic Circulating

CENTRALIZED LUBRICATION TO FIT THE NEED

Niagara Inclinables are readily equipped with either manually-operated or automatic lubricators, or automatic circulating oil systems. It's one of the many ways in which Niagara outfits standard inclinables to meet individualized requirements.

ALL TYPES OF AUTOMATIC FEEDS

To speed production, Niagara Inclinables are easily equipped with complete, automatic feed arrangements: single roll, double roll, dial, chute, magazine and specially engineered types. Variable speed drives can be provided to allow adjustment for the optimum speed consistent with the die, material and feed length.



GET ALL OF THE FACTS on any or all Niagara Inclinable Presses. Consult with a Niagara representative. His recommendation will be impartial. He has all types of OBI's to offer. At your request, specific Bulletins on each series, containing complete information and specifications, will be mailed to you promptly.

NIAGARA

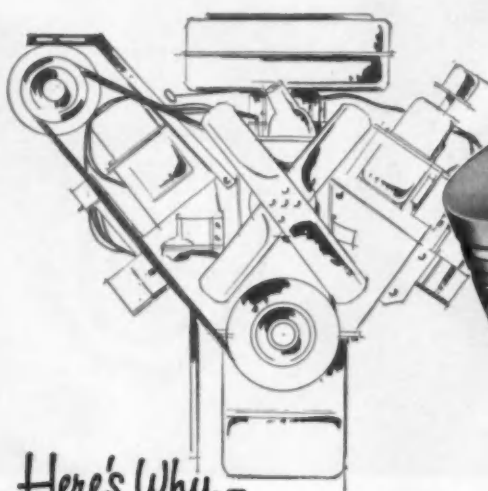
America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

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Specify Muskegon design for *and*



Here's Why -

Muskegon—producer of the piston rings used in more than one out of every three new cars—offers these important advantages for your 1958-59 plans:

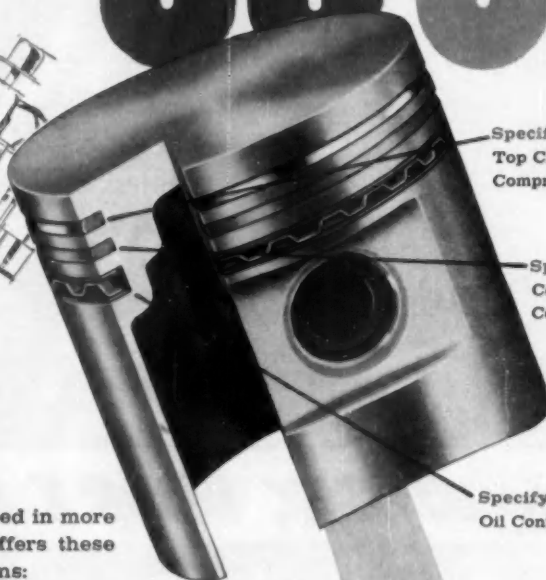
ENGINEERING ABILITY: Muskegon's engineers design and develop all types of piston rings to meet exact requirements of every piston groove for any model of any engine. This precise engineering is why more than one out of every three new cars is equipped with Muskegon piston rings—all the way.

EXPERIENCE: You benefit from Muskegon's vast knowledge . . . experience gained from pioneering piston ring firsts, such as "Unitized" steel oil rings, chrome plated "Unitized" oil rings, sintered powdered metal rings and lapped chromium plated steel segments.

COOPERATION: Muskegon works closely with your engineers in the evolution of rings for all applications, including engines, transmissions, power steering and air compressors . . . ring designs that are worthy of the expense and time you put into new developments.

FACILITIES: Muskegon has the manpower and the facilities to give you bulk quantities of piston rings when you need them. Muskegon rings are also available in ready-packaged sets, with your own label, for your service shop requirements.

This is why you should seriously consider Muskegon design—exclusively—for '58 and '59.



Specify Muskegon
Top Chrome
Compression Rings

Specify Muskegon
Center
Compression Rings

Specify Muskegon
Oil Control Rings



MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

Since 1921... The engine builders' source!

AFFILIATE: Rotary Seal Division, manufacturers of mechanical seals for rotating shafts since 1931.
Plants at Chicago, Illinois and Sparta, Michigan

DETROIT OFFICE:
521 New Center Bldg.
Telephone: Trinity 2-2113

SURE DELIVERY



Yale Truck speeds shipments of new Chrysler transmissions.

FROM ASSEMBLY TO SHIPPING, TRANSMISSIONS GET SMOOTH, SAFE RIDE ON YALE TRUCKS

At the huge Chrysler PowerFlite Transmission plant in Indianapolis, Yale Electric Trucks keep pace with a steady flow of new transmissions as they come off the assembly line. These rugged, 6,000 lb. capacity Yale Trucks pick up 15 transmissions at a time, carry them quickly and safely to loading docks for fast shipment.

This relay operation is continuous and trouble-free. Yale Electric Trucks are built to stand up under heavy-duty working conditions. And, to assure safe, smooth, shock-free handling of heavy loads, Yale Electric Trucks

include many premium engineering features such as Yale's exclusive Magnetic Cam-O-Tactor for smooth, controlled acceleration; shock-resistant steering mechanism for extra handling ease; "Dead-Man" control to set mechanical wheel brakes when operator leaves the truck. A lowered cowl and new roller channel construction give the operator more forward visibility, increase driver efficiency and safety. Yale Electric Trucks come in capacities from 1,000 to 150,000 lbs. For full facts, send coupon today.

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**INDUSTRIAL LIFT TRUCKS
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The **YALE & TOWNE** Manufacturing Co., Dept. 72,
Roosevelt Boulevard, Philadelphia 15, Pa.
Please send me latest literature on Yale Electric Trucks.

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Gasoline, Electric & LP-Gas Industrial Lift Trucks • Worksavers • Warehouseurs • Hand Trucks • Hand and Electric Hoists

7 great lapping machines for your profit-boosting



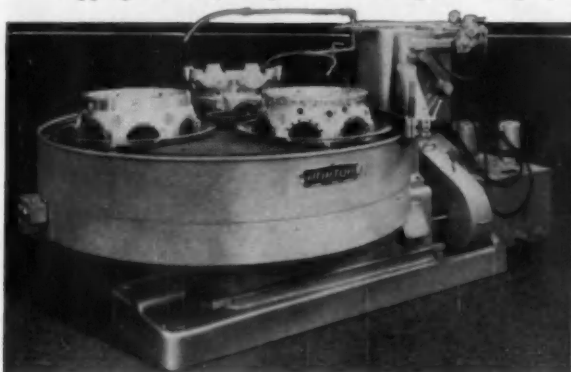
If you are performing single or parallel face flat lapping operations you'll get real profit-boosting qualities from the ability of these machines to improve your product quality — shorten production time — lower your lapping costs. In other words — from their ability to give you the "Touch of Gold".

With NORTON HYPROLAP[®] machines you'll lap fast — and get clean work on which you can do further machining without cleaning operations — because their bonded abrasive laps leave your parts free of imbedded grit. The hydraulically operated truing devices on these machines provide additional advantages in assuring truth of lap face — plus the convenient means of quickly changing lapping action by rough or fine truing of the lap by

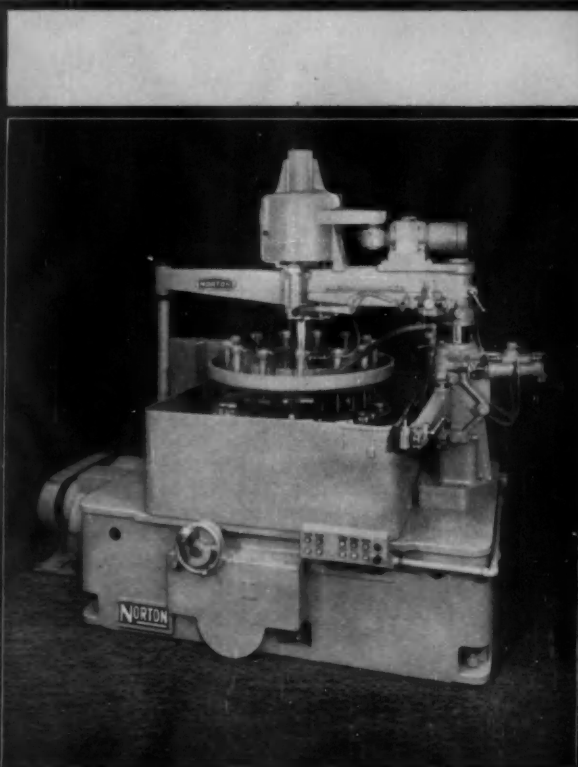
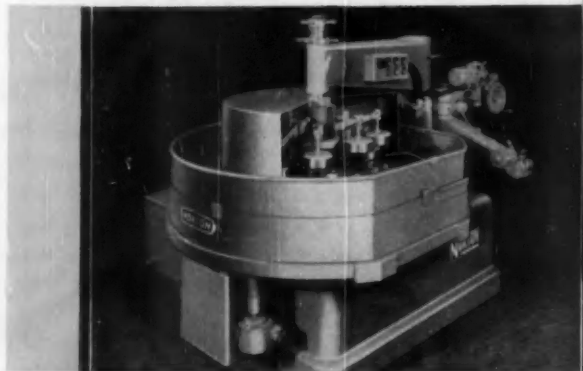
simple adjustment of the speed of the truing arm.

For operations requiring cast iron laps, you will get continuing high investment return — and steady, low cost production from the #16-FC and #28 Lapping Machines — because of their simplicity of operation — and outstanding durability. They'll operate steadily for you with minimum attention or maintenance — hour after hour — day after day.

For further facts see your Norton representative or write direct. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.



HYPROLAP SINGLE FACE FLAT LAPPING MACHINES #60-F (above) and #36-F (below). Sensational performers using bonded abrasive laps and filtered coolant. Provide clean seal surfaces, wear surfaces or reference surfaces for further machining. Available for small or large production lots: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. Rigid power-operated truing arm insures true flatness of abrasive lap and finished work pieces. Heavy or light parts handled with equal ease.



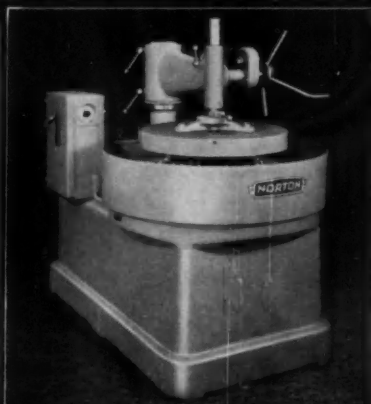
HYPROLAP SINGLE OR PARALLEL FACE FLAT LAPPING MACHINE #48-F. Similar to the #60-F and #36-F Lappers in speed and accuracy, with provision for parallel face flat lapping. For single face flat lapping the machine mounts a single 48" diameter bonded abrasive lap. For lapping opposed parallel flat surfaces an upper lap is added. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed.



HYPROLAP LAPPING MACHINE #26. A high speed machine for two face flat lapping or cylindrical lapping that finishes up to 100 or more work pieces simultaneously. Lapping pressure is hydraulically powered and controlled — an exclusive Norton development. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. Like other HYPROLAPS, lap truing is hydraulically powered and controlled.



HYPROLAP LAPPING MACHINE #12-F. For small, parallel face flat lapping. Ideal for small ball bearings. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. All three provide fast efficient lapping with selective speeds for laps and work-holders, permitting positive selection of ideal speeds for each job. Cleanliness of finished work surfaces eliminates the need for cleaning operations.



PLAIN TIMED CYCLE LAPPING MACHINE #28. Produces flat or cylindrical surfaces to extremely close tolerances and high degree of finish. Uses cast iron laps with loose abrasive. An attachment for cylindrical lapping is furnished with the regular flat lapping arrangement. For plug gage or gage block tolerances the machine is unsurpassed. An arrangement for hand lapping with 30", 36" or 40" cast iron laps is also available.



PLAIN TIMED CYCLE LAPPING MACHINE #16-FC. An outstanding performer for flat or cylindrical work, such as Diesel injector parts, plug gages, size blocks, sides of rings and short cylindrical parts. Using cast iron laps with loose abrasive it produces optically flat surfaces to extremely close thickness tolerances. Its fine repetitive accuracy helps reduce inspections and eliminates the need for selective assembly.



NORTON JOB LAPPING SERVICE. Improve your product quality by precision lapping. The Norton Job Lapping Department, complete and modern in every detail, is ready to finish jobs to your exact specifications. Flat or cylindrical lapping operations handled quickly to your tolerance specifications. Parallel face flat lapping is our specialty. See your Norton representative or write direct.

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

*Making better products...
to make your products better*

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

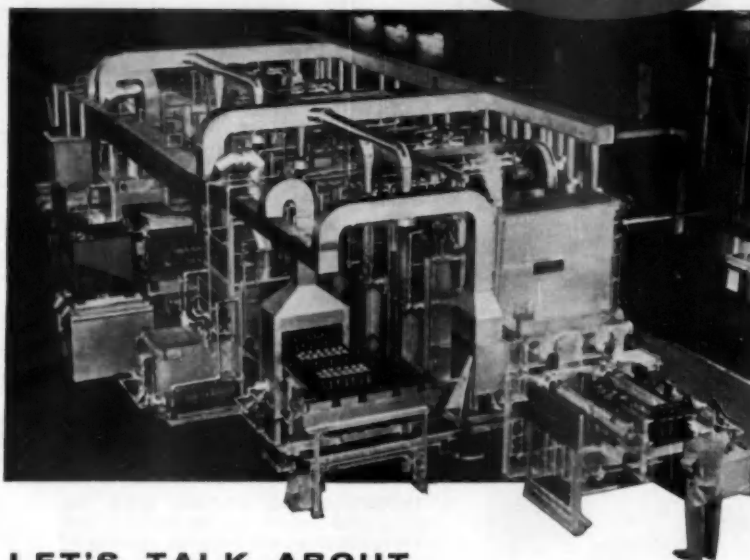
BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Behr-cat Tapes

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BLAZING THE HEAT TREAT TRAIL WITH

HOLCROFT



LET'S TALK ABOUT HEAT TREAT STANDARDS

When you take a long look at today's heat treat standards, you'll find that many of them were originated or perfected by Holcroft and Company.

For example, back in 1922 the removable electric heating element was developed. As far back as 1934, Holcroft recognized the significance and importance of equilibrium constants and their value to controlled atmosphere heat treating. And in 1945, was initiated the use of refractories and ceramics in place of scarce and expensive nickel-chrome alloys in vital parts of the furnace. These are only three of many, many innovations which have become heat treat standards in the industry.

Pioneering in the past—forward thinking for the future . . . that's what you get when you invest in a Holcroft heat treat installation. And that investment is returned in the form of higher quality control standards and lower heat treat costs. Better investigate—today!

HOLCROFT AND COMPANY



6345 EPWORTH BOULEVARD • DETROIT 10, MICHIGAN
PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

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CANADA: Walker Metal Products, Ltd., Windsor, Ontario

CALENDAR

OF COMING SHOWS AND MEETINGS

- American Management Association, annual electronics conference, Hotel Statler, New York, N. Y. Feb. 25-27
- Leipzig Fair, Germany Mar. 3-14
- National Mobile Homes Show, Coliseum, New York, N. Y. . . . Mar. 4-10
- SAE National Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac Hotel, Detroit, Mich. Mar. 5-7
- Pressed Metal Institute, annual spring technical meeting, Hotel Carter, Cleveland, O. . . . Mar. 6-8
- Pacific Automotive Show, Civic Auditorium, Seattle, Wash. Mar. 7-10
- Atomic Exposition and Nuclear Congress, Convention Hall, Philadelphia, Pa. Mar. 11-15
- NAM Institute on Industrial Relations, Hollywood, Fla. . . . Mar. 11-15
- Association of National Advertisers, spring meeting, Homestead, Hot Springs, Va. Mar. 13-16
- National Industrial Conference Board, fifth conference on Atomic Energy, Philadelphia, Pa. Mar. 14-15
- Geneva Automobile Show, Switzerland Mar. 14-24
- Society of the Plastics Industry, annual national conference and Pacific Coast plastics exposition, Los Angeles, Calif. . . Mar. 18-21
- ASME Gas Turbine Power Conference, Sheraton-Cadillac Hotel, Detroit, Mich. Mar. 18-21
- Military Automation Exposition, Trade Show Bldg., New York, N. Y. Mar. 18-21
- SAE National Production Meeting and Forum, Hotel Statler, Buffalo, N. Y. Mar. 20-22
- American Society of Tool Engineers, silver anniversary technical meeting and convention, Shamrock Hilton Hotel, Houston, Tex. Mar. 25-27
- Western Metal Congress and Exposition, Los Angeles, Calif. Mar. 25-29
- ASME Engineering Management Conference, William Penn Hotel, Pittsburgh, Pa. . . . Mar. 27-28
- American Power Conference, Hotel Sherman, Chicago, Ill. . . Mar. 27-29
- SAE National Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Commodore, New York, N. Y. . . Apr. 2-5
- ASME Instruments & Regulators Conference, Northwestern Univ., Chicago, Ill. . . . Apr. 7-10
- ASME Spring Meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala. Apr. 8-10
- National Packaging Exposition and Conference, Chicago, Ill. . . Apr. 8-11
- American Welding Society, national spring meeting and fifth welding and allied industry exposition, Philadelphia, Pa. . . . Apr. 8-12
- Conference on Electronics in Industry, Ill. Institute of Technology, Chicago, Ill. Apr. 9-10
- U. S. World Trade Fair, Coliseum, New York, N. Y. Apr. 14-27
- National Industrial Research Conference, Conrad Hilton Hotel, Chicago, Ill. Apr. 24-25
- Materials Handling Exposition and Conference, Philadelphia, Pa. Apr. 29-May 3

Heat-Treated Castings

Heat-treating facilities range from small batch type furnaces through continuous quench and temper furnaces to meet modern casting requirements.



Intricate Castings

CWC metallurgical engineering, control and mechanization provide the means to produce castings of the most intricate design.



Here's how CWC meets grey iron, iron alloy and steel casting needs !

Six Campbell, Wyant and Cannon foundries, located in the heart of the Great Lakes industrial area, are fully equipped to produce the castings you need. Superior quality is maintained through exacting inspection and testing methods. Complete mechanization assures volume production at low cost and delivery on schedule. Look to CWC research engineering and facilities as your source for iron and steel castings. Write today . . . get your copy of the "One Source" booklet. It tells why CWC is the best source for many different casting requirements!

Steel Castings

CWC's extensive facilities make possible the production of over 150 tons of steel castings a day.

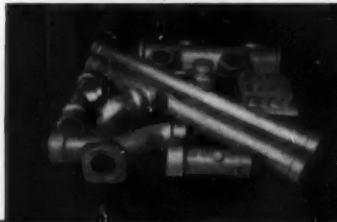


Castings With Special Properties

CWC's development of special purpose electric alloy irons for greater strength and resistance to wear, heat and corrosion helps cut machining time and costs.

General Purpose Castings

A large variety of general purpose castings are produced in the CWC foundries.



campbell
wyant and
cannon

FOUNDRY COMPANY

Division of Textron Inc.
Muskegon, Michigan

CWC




Centrifugal Castings

A pioneer in centrifugal casting, CWC alloys its own special metals in electric furnaces for proper uniformity in density and structure.



SIX FOUNDRIES LOCATED IN MUSKEGON, LANSING AND SOUTH HAVEN, MICHIGAN . . . READY TO SERVE YOU



**SURE, POWER STEERING
MAKES THE JOB EASIER.
BUT IT'S THE ADDED SAFETY
THAT COUNTS MOST.**

**OUR POWER-STEERED
RIGS STAY ON SCHEDULE
BETTER, TOO.**

**EITHER WAY,
POWER STEERING MAKES
GOOD BUSINESS SENSE.**

THE CASE FOR POWER STEERING ON TRUCKS!

The trend to power steering on trucks is based on one very practical reason—operators of trucks equipped with power steering have invariably found that the added safety and greater operating efficiency of their vehicles have demonstrated that power steering is indeed a sound investment.

Truck drivers using power steering report less tension and fatigue in normal driving and appreciate the positive control that blocks road shock from chuck holes and prevents loss of control if the truck is forced out on a soft shoulder.

The dispatcher knows the importance of regularly maintained schedules. He is quite aware that with power steering drivers are more relaxed and are better drivers than tired drivers. Thus, power steering not only reduces the hazard of road accidents, but helps the driver to maintain established schedules through better vehicle control.

In short, power steering, by saving time and money, contributes materially to a more profitable operation.

Truck manufacturers are always eager to offer their customers features

that will make truck operation safer and more profitable and, at the same time, give their dealers every selling advantage.

That's why more and more truck manufacturers are offering performance-proven Bendix* Power Steering as original factory equipment.

If you would like to know why power steering for trucks is perhaps even more logical than power steering for passenger cars, we have prepared an interesting folder on the subject.

Write for your copy today. We think you'll be convinced.

*REG. U.S. PAT. OFF.

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Chestnut & 56th Sts.
Philadelphia 39, Pa., U.S.A.

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High Spots of This Issue

★ The Bendix Electrojector Fuel Injection System

Designed for use on any automobile engine, the electronically controlled and electrically actuated Bendix fuel injection system has timed intake port injection. This and other features are described in detail for the reader. Page 50.

★ Lighter, Higher-Powered Engines at Motor Boat Show

Capitalizing on the skyrocketing popularity of boating, both outboard motor and inboard engine producers have broadened their product lines considerably. Evidence of this trend was pronounced at the Motor Boat Show in January. See Page 54.

★ Design of the TorqueFlite Transmission

Chrysler Corp.'s latest automatic transmission is analyzed here in minute detail from the design and operating viewpoints. Its important characteristics are clearly explained through the use of several graphic diagrams. Page 58.

★ Ceramic Tooling at Ford Permits Higher Output

Ever alert to the possibilities of new metal cutting techniques, Ford has been experimenting with ceramic tools for the past two years. Two major applications have already come into volume use and others seem quite likely. Page 61.

★ Many Advances in Equipment at 1957 Road Show

Over 60,000 persons jammed Chicago's International Amphitheatre last month to see the greatest assemblage of road-building machines ever gathered under one roof. Nearly 300 exhibitors displayed \$12 million worth of equipment. Page 62.


★ 37 New Product Items

And Other High Spots, Such As:

Special fasteners; SPE meeting; high-temperature magnesium; British automatic transmission; wheel, hub, and brake drum die cast as integral unit; precision bearing for automobile engines; and trends in valve gear design.

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AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT



If you machine parts like these ...

**we can save you
UP TO 30%**

... with Ryerson leaded steels

If you machine carbon or alloy steels for production or maintenance applications—you should be able to make substantial savings by switching from a standard steel to a Ryerson *lead*ed steel.

We can tell you about customers who produce up to 50% more parts per machine hour, now that they have changed over to a leaded steel recommended by Ryerson. Others report tool life lengthened as much as 300% ... rejects reduced to all-time lows ... machine down-time slashed ... finishing processes eliminated.

The nation's largest stocks of leaded steels in a wide range of types and sizes are ready for quick shipment from Ryerson. (See listing below.) Each is the fastest machining steel of its type available anywhere. If you are not now using leaded steels, it will be worth your while to investigate the possibility of adapting one of them, or several, to your operations.

A Ryerson representative will be glad to work with you. Show you dozens of case histories—good hard facts that document just how well Ryerson leaded steels have worked out under actual shop operating conditions. Call your nearby Ryerson plant.

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CARBON STEEL BARS

Ledloy (Screw Steel) ... Cold drawn rounds, squares, hexagons.

Rycase (Case Hardening, Low Carbon, Manganese) ... Cold finished rounds.

ALLOY STEEL BARS

Rycut 20 (Low Carbon, Case Hardening) ... Hot rolled and cold finished rounds.

Rycut 40 (Medium Carbon) ... Hot rolled and cold finished rounds, annealed to heat treated and stress relieved.

Rycut 47 (Medium Carbon) ... Hot rolled, annealed rounds.

New Rycut 50 (Medium Carbon) ... Hot rolled and cold finished rounds in annealed condition, hot rolled rounds heat treated and stress relieved.

Leaded 8620 ... Rounds hot rolled, cold finished.

Leaded 4140 ... Rounds, cold finished, annealed or heat treated and stress relieved.

Leaded 8647 ... Rounds, hot rolled, annealed.

CARBON STEEL PLATES

New E-Z-Cut Plates (Hot rolled, low carbon, manganese.)

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 116, No. 4

February 15, 1957

Ford Sales and Income for '56 Down But Assets, Worth Raised

Net income of Ford Motor Co. in 1956 was \$236.6 million on sales of \$4.647 billion, a preliminary report shows. The figures compare with earnings of \$437 million on sales of \$5.594 billion in 1955.

Commenting on the report, Henry Ford II, president of Ford, stated that the company incurred unusual costs last year for facilities and product line expansion programs. These expenditures, he pointed out, will not contribute to income until the new plants are in full operation and new products sold in volume.

These costs amounted to approximately \$90 million, compared with \$50 million in 1955. The company spent a record \$530 million in 1956 for expansion, modernization, and replacement of facilities, excluding special tools.

Total company assets at Dec. 31, 1956, were \$2,792,600,000, compared to \$2,585,300,000 a year earlier. Net worth was \$1,987,500,000, against \$1,868,200,000 at the end of 1955.

Chevrolet to Offer Limited-Slip Axle

Chevrolet is the first large volume producer to offer a limited-slip differential as an optional item on its passenger cars. Called the "Positraction," the differential is priced under \$50. It is supplied by Spicer.

Originally Chevrolet had intended to offer the differential only on the Corvette to provide more positive traction for racing events. It counteracts traction losses from wheel bounce and provides more "dig" on the inside wheel on turns.

Chevrolet is capitalizing on current heavy snowfalls throughout the country to promote the differential as



SPS WEST COAST PLANT HAS FUNCTIONAL MODERNITY

Shown here is an artist's drawing of a new \$5 million plant to be built by Standard Pressed Steel Co. at Santa Ana, Calif. The highly modern, multi-product manufacturing facility will enable the Jenkintown, Pa., producer of precision metal fasteners and pressed steel shop equipment to cut considerably lead time on deliveries to West Coast customers. The 280,000 sq ft plant, set for completion in early 1958, will operate on a straight line production basis under present plans.

a traction and safety device. Engineers say that it transfers torque to the wheel with best traction to maintain forward motion on slippery surfaces or rough roads when one tire may be momentarily off the ground.

Currently Packard, Lincoln, and Studebaker are the only other manufacturers offering a low-slip differential, but others are expected to adopt the device in the near future.

Ten Millionth Plymouth Comes Off Assembly Line

Plymouth last month (January) marked a milestone with production of its 10 millionth car. In observing the event, the company noted that the original model in 1928 provided several "firsts" in the low price field. Included were four-wheel hydraulic brakes, full pressure engine lubrication, aluminum alloy pistons, and independent hand brake.

AMC Awarded Second Contract for Parts Work on Seaplane

American Motors has received another major contract to manufacture components for the Martin jet seaplane, the P6M SeaMaster. Under the new contract, AMC will produce rotary mine bay doors for the 600-mile-an-hour Navy plane, believed to be the fastest low-altitude aircraft in the world.

Work on the contract will be done by AMC's Special Products Div., which recently completed design and testing of a SeaMaster mechanism for carrying and releasing weapons. In addition to the SeaMaster projects, the Special Products Div. currently is engaged in work on jet and turbine engine components, production of .50-caliber cupolas, research on aircraft-laid sea mines, a lightweight airborne vehicle, and a new air-cooled V-4 engine for army vehicles.

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FAST JAGUAR BUILT FOR BOTH TOURING AND RACING

Designed as a sports-racer for the American market, the new Jaguar XK "SS" is based on the Le Mans D-type with 250-hp engine and disk brakes. It includes such refinements as folding hood, large curved windshield, comfortable upholstery, full instrumentation, luggage grid, and bumpers. This two-seater is intended to meet the demand for a fast touring car suitable for competition work. Price is about \$6900.

Engine Output Underway At I-H Louisville Plant

The Louisville, Ky., plant of International Harvester Co. last month (January) turned out its first Black Diamond truck engine. Output of the six-cylinder engines (formerly made at the Indianapolis Works) is expected to be stepped up gradually in the coming months.

The company estimates it will add about 1000 workers on the truck engine assembly line this year. In addition to engines, the Louisville plant turns out farm tractors.

Edsel Div. Will Offer 18 Models in 4 Series

Edsel Div. will come into the market this Fall with 18 models in four series. Included will be a complete product mix of two- and four-door sedans, station wagons, hardtops, and convertibles.

Richard E. Krafve, general manager of the division, revealed the product lineup at a press conference in Detroit early this month. The four series will start pricewise with the Ranger, and proceed upward through the Pacer, Corsair, and Citation.

Krafve did not reveal how the series will differ in specifications or price, but it is known that the Edsel will come in two wheelbases and will bracket Mercury in price. The

Ranger and Pacer will have the shorter wheelbase and have some stampings interchangeable with Ford. The remaining two series will have larger dimensions and have some stampings common with Mercury.

The four series lineup of the Edsel confirms opinion that it will be positioned "nose-to-nose" with Buick, which is the only other maker to offer four series. Production and assembly plans parallel those followed by Buick. Edsel will share assembly facilities and certain common components with other divisions of the parent company, as does Buick.

Krafve also set the record straight on reports that the original debut date of the Edsel has been advanced. He said there has been no change from the Fall schedule announced several months ago.

Production plans for the Edsel call for assembly in six or seven Ford and Mercury plants around the country. Ford plants at Milpitas, Calif., and Somerville, Mass., have been designated so far, and others will be announced soon. Ford production will be moved from Somerville to other Ford East Coast plants.

Engines for the Edsel will be built at a new plant now being tooled at Lima, Ohio. The timetable calls for substantial production there by late June. Engines may later be produced at Dearborn and Cleveland, also.

Kaiser Planning to Construct Sheet Metal Plant in Columbia

Kaiser Industries continues to make progress on its long-range program to produce automobiles in other countries, including Peru, Columbia and Brazil. Most recent step in that direction is a government announcement from Bogota, Columbia, that the company will build a metal stamping plant in that country.

Kaiser's initial investment on the Columbia program will total approximately \$40 million. It is understood that part of the outlay will be used for shipbuilding facilities. The Columbia project represents the second phase of the company's program to manufacture automobiles in South America. Kaiser also has an agreement to build cars and trucks in Cordoba, Argentina.

Interchangeability Progress Noted in Industrial Engines

Reports of the high degree of interchangeability effected in industrial engine parts and accessories sparked the February meeting of the Detroit Armed Service Mobilization Council. The session was sponsored by the Corps of Engineers, and Continental Motors Corp. acted as host.

Continental has for some years carried on a small industrial engine standardization program for the Corps of Engineers. Preliminary work has been completed on the ½, 1½, 3, and 6-hp sizes, and Continental has been awarded a contract to build 1000 each of the first three types for experimental field service testing. Most of the structural elements of these small engines are designed to use aluminum alloy die castings.

So great has been the progress made in interchangeability of parts that 96 models of engines now qualify under established standards. Similar advances have been made in the accessory category.

Continental is expected to announce at a future date new turbo-jet engine models with less weight, greater thrust, and lower fuel consumption.

It was also disclosed that power output of Ordnance aircooled engines has been increased by shell-molded cylinder heads with thinner fins.

AND AVIATION INDUSTRIES

Four-Door Century Revived By Buick for Price Reasons

The belief that the four-door "hardtop" eventually would replace the conventional sedan has suffered a set-back. That is evident from the announcement that Buick is reintroducing the four-door sedan in its middle-priced Century series.

Buick dropped the four-door sedan in that price line when it brought out the four-door hardtop Riviera in the same series with 1956 models. Since then, it has been the only company not offering a four-door sedan in the middle-priced bracket.

Hardtops have of course been increasing in popularity. However, Buick's decision to add a cheaper-priced model in the Century series is indicative of the general price resistance that has developed in the medium and low-medium price classes.

As a result, several car companies are taking a second look at their promotional efforts. The big emphasis now is on price.

Current Buick advertising, for example, plugs "the wide range of prices that start just above the low price class." The campaign advertises a two-door Special sedan at a manufacturer's suggested price of \$2595.83. Included are Federal excise taxes and delivery and handling charges. The ads note, however, that the price "may vary from dealer to dealer."

Chrysler Sales, Earnings Fell Sharply in '56; Outlays Cited

Earnings of Chrysler Corp. for 1956 declined to \$19,952,969 from \$100,063,330 in 1955. Sales fell off from \$3,466,222,350 a year earlier to \$2,676,334,431 in 1956.

Chrysler president L. L. Colbert explained that the 80 per cent drop in earnings was due not only to lower demand, but to other factors as well. He mentioned particularly heavy outlays for design, engineering, and development of 1957 cars.

Chrysler spent a record \$281,321,084 in 1956 for plant expansion and modernization and tooling. Net current assets totaled \$208,216,862.



ASTRA RUNABOUT IS PRACTICAL UTILITY VEHICLE

The British Astra runabout carries two persons and 250 lb of cargo. The two-cylinder, two-stroke, 15-hp British Anzani engine at the rear features rotary valves and air cooling. It chain-drives the differential through a three-speed gearbox. All wheels have independent suspension and hydraulic brakes for practical operating ease.

Pontiac Fuel Injection Car Commands Real Premium Price

Pontiac's high price of \$5782 for its fuel-injection equipped Bonneville special convertible serves to underscore the experimental nature of the division's present use of fuel injection. Only about 1500 of the cars will be built this year for sale to dealers exclusively for promotional pieces and to train their service departments. Pontiac also hopes to get valuable field experience with the system.

The Bonneville is completely equipped with deluxe features and power assists. Even so it is priced almost \$2000 above the most expensive production models. The Rochester fuel injection system is practically tailor-made for each car to account for much of the additional cost.

The cars are not to be sold to the public. If a dealer should sell his allotted car, he will not be supplied with a replacement.

Ford Earmarks \$710 Million For Capital Outlays in 1957

Confident that its current high rate of production will continue, Ford Motor Co. this year plans to spend approximately \$710 million on its stepped-up expansion program. The figure includes tooling for 1958 models, plus new manufacturing equip-

ment for the forthcoming Edsel car.

The 1957 outlay is the second largest in Ford's history, topped only by the \$780 million spent in 1956. It will bring to more than \$4.18 billion the company's total capital expenditures since World War II. The total also includes projects already approved which are scheduled to be completed in 1958 and part of 1959.

Some of the projects include a Ford assembly plant at Lorain, O. to be completed in 1958; a new Mercury plant at Los Angeles, and a Lincoln plant at Novi, Mich. The latter two are slated for completion this year. At least five other major manufacturing plants are planned.

Copco Trailers Plans Output Of Lower-Cost Aluminum Unit

Since its acquisition less than a year ago by Copco Steel & Engineering Co., Copco Trailers Div. (formerly Edwards Trailer) has moved ahead considerably. Several top caliber men have been brought in from both Strick Trailer and Fruehauf, and many new plans are afoot.

One calls for expansion of its aluminum trailer line, which accounts for 95 per cent of the company's business. The remainder comes from steel trailers. The company soon will add a lower-priced aluminum unit called the "93", which designates

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trailer width. The model it has been marketing so far is the "94".

The new trailer will have basically the same design as the one Copco has been making. However, it will have structural steel channel cross members instead of aluminum. It will also have slightly different posts. The new trailer will cost about 10 to 15 per cent less than the present one.

The company is attempting to broaden its market coverage considerably. It has appointed Great Lakes

Trailer Co., Detroit, as its first distributor.

It is hoped that at least two more distributorships will be opened within the next year—one in the Midwest and another in the East. The company until now had no distributors as such, only salesmen.

The company hopes to double trailer output this year. At present, it is turning out five units a day. This figure will be boosted to eight a day when the new trailer comes out.

American Brake Show Sets Up New Engineered Castings Div.

American Brake Shoe Co. has organized a new Engineered Castings Div. to integrate five foundries and coordinate sales of their output. N. George Belury, vice-president of the firm, has been named president of the new division. It will make a wide variety of plain and alloyed iron and steel castings.

The five Brake Shoe foundries integrated by the move are located at Medina and Rochester, N. Y.; at Mahwah, N. J.; South San Francisco, Calif.; and Melrose Park, Ill.

Before the change, Brake Shoe included among its components an Engineered Castings Div. However, only two foundries were contained in it.

Electric Furnace to Double Sharon Stainless Capacity

Sharon Steel Corp. has broken ground for a new \$6 million electric furnace facility at its Roemer Works in Farrell, Pa.

The new furnace will go into operation in 1958. It will more than double the present 72,000-ton annual capacity of electric-furnace steel at Sharon.

Output from the new furnace will go into high-alloy, high-quality stainless and specialty steels. A second new electric furnace will be installed at a later date.

LeTourneau To Re-Enter Earthmoving Business

R. G. LeTourneau, Inc., next year will re-enter the earthmoving equipment business, which it sold to Westinghouse Air Brake Co. in 1953. The company cannot go into that field any sooner than 1958, since it has a five-year agreement with Westinghouse which bars it from making earthmoving equipment until after May 1, 1958.

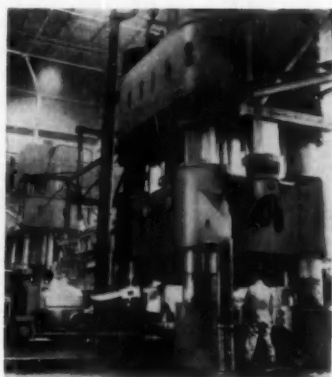
In the interim, LeTourneau has been making off-road transportation, logging off-shore, and other equipment, which it will continue to produce. A new line of earthmoving equipment will be added and plant facilities expanded when the present agreement with Westinghouse Air Brake expires.

1957 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	For Weeks Ending			Total—Jan. 1 to—	
	Feb. 2	Jan. 26	Jan. 19	Feb. 2, 1957	Feb. 4, 1956
PASSENGER CAR PRODUCTION					
Hudson	0	27	98	285	1,629
Nash	0	30	162	591	3,776
Rambler	0	396	1,967	3,341	11,904
Total—American Motors	0	455	2,225	6,217	17,309
Chrysler and Imperial	4,153	4,196	4,200	10,684	14,912
De Soto	3,848	3,682	3,680	17,036	13,630
Dodge	6,549	6,508	6,131	29,334	26,057
Plymouth	14,102	15,205	14,934	69,527	69,719
Total—Chrysler Corp.	28,652	29,591	28,925	130,561	114,310
Ford	32,340	35,155	34,350	159,674	145,221
Lincoln and Continental	1,415	1,363	1,419	6,416	7,077
Mercury	7,987	8,079	8,556	38,465	26,173
Total—Ford Motor Company	41,382	44,597	44,335	204,555	178,471
Buick	11,600	11,567	12,419	58,990	75,990
Cadillac	3,444	3,566	3,472	15,769	16,217
Chevrolet	34,211	34,300	33,519	157,917	174,140
Oldsmobile	10,063	10,146	10,226	47,468	57,338
Pontiac	9,632	9,362	9,339	43,131	43,333
Total—General Motors Corp.	68,950	68,963	68,975	321,261	367,026
Packard	574	604	448	2,155	4,187
Studebaker	919	976	954	4,900	15,502
Total—Stude-Packard Corp.	1,493	1,582	1,302	7,055	19,689
Checker Cab	76	10	34	255	39
Total—Passenger Cars	140,563	145,198	145,796	609,944	696,852
TRUCK PRODUCTION					
Available	6	6	7	22	25
Chevrolet	7,800	7,055	7,375	34,680	41,691
G. M. C.	1,509	1,946	1,478	7,722	9,493
Diamond T	80	80	80	386	466
Dodge	80	79	80	365	481
Dodge and Fargo	1,862	1,827	1,868	8,119	8,077
Ford	7,739	7,696	5,727	25,056	33,224
F. W. D.	28	18	31	116	122
International	1,255	1,215	2,917	10,538	14,859
Wack	413	419	411	1,740	1,830
Reo	72	54	71	288	389
Studebaker	236	223	227	1,167	1,724
White	341	347	346	1,561	2,012
Willys	1,697	2,003	1,550	6,009	6,642
Other Trucks	80	68	64	354	596
Total—Trucks	23,207	23,144	21,980	96,714	121,631
Buses	68	57	64	296	362
Total—Motor Vehicles	163,839	168,399	167,816	706,954	818,875

AND AVIATION INDUSTRIES



GIANT FORGING PRESS

This hydraulic forging press, now in production at the Torrance, Calif., works of Harvey Aluminum, is capable of exerting 8000 tons of pressure for forging aluminum parts. Overall height of the press is 53 ft with 35½ ft off floor.

Clark Starts Construction On New Plant In Chicago

Clark Equipment Co. has started construction on a 300,000 sq ft plant in Chicago. While few details have been given about the plant, the company indicated it would probably be used as a spare parts service center or manufacturing and assembly plant. Completion is scheduled for June.

Kelsey-Hayes to Make Parts for New Type Plane Engine

Kelsey-Hayes Co., which has been broadening its activities for the past year or so, is entering another phase of aircraft production. It will manufacture parts and assemblies for a jet engine to be used in a new type of businessman's plane. First contract for the work was let recently.

N. Y. Roadbuilding Firm Acquired by Yale & Towne

The acquisition of Contractors Machinery Co., Inc., Batavia, N. Y., by Yale & Towne Manufacturing Co. will now give the latter a third materials handling division. Yale & Towne acquired the net assets and business of the N. Y. roadbuilding and loading equipment through an exchange of stock.

A I TABLOID A I

Curtiss-Wright Corp. reportedly may build the new Iroquois jet engine under license from A. V. Roe, Canada, Ltd.

Sullivan Powdered Metals, Inc., has formed a new Research and Development Div. It will work in cooperation with the research laboratories of Aluminum Co. of America.

The British aircraft industry is planning to design and produce a supersonic airliner on a cooperative basis.

Greer Hydraulics, Inc., has bestowed its Maintenance Award for 1956 on Beech Aircraft Corp.

Boeing Airplane Co. has abandoned plans to produce and assemble its Bomarc guided missile in California. It has allowed to expire a purchase option on the former Ford assembly plant at Richmond, Calif.

Iron and steel companies indicate that they plan to spend a record \$1.7 billion this year on new equipment and construction.

L. A. Young Spring & Wire Corp. has purchased machinery, tooling and complete assets for manufacture of aluminum honeycomb structures from Flexo Manufacturing Co., Inc.

Westinghouse Electric Corp. will break ground for its new transformer plant at Athens, Ga., on Feb. 26.

Baldwin-Lima-Hamilton Corp. has completed transfer of the manufacturing and sales operations of its hydraulic and compacting press department from the Eddystone Div. (near Philadelphia) to the Hamilton Div., Hamilton, O.

Bell Aircraft Corp. plans to spend \$15 million to improve its research and development facilities on the Niagara Frontier.

Wyman-Gordon Co. has disclosed that it acquired ownership of Prex Corp. last Fall. It will double the latter's work force eventually.

Joseph T. Ryerson & Son, Inc., has changed the title of the local manager at each of the 17 steel service plants from plant manager to general manager.

American Machine & Foundry Co. has acquired J. B. Beard Co. . . . Thiokol Chemical Corp. has acquired National Electronics Laboratories, Inc.

Stewart-Warner Corp. is now handling distribution of its line of electronic industrial balancing equipment formerly marketed by Merrill Engineering Laboratories.

DoALL Co. has launched the second in its series of traveling exhibits—"The Story of Measurement"—on the first lap of its tour throughout the U. S.

General Electric Co. is delaying construction of its missile engineering and research center at Valley Forge, Pa.

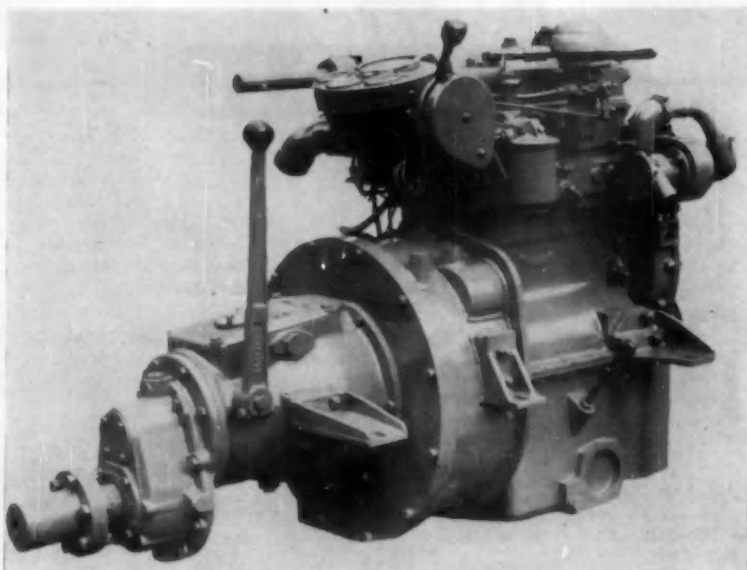
Sealed Power Corp. has opened a new distribution office at 1510 Belleville St., Richmond, Va.

Taft-Peirce Mfg. Co. has set up a new Instrument Gage Div. . . . Kaman Aircraft Corp. has formed a new Nuclear Div. located in Albuquerque, N. M.

Illinois Gear & Machine Co. has sold all of its outstanding stock to Hubbard and Co.

(Turn to page 94, please)

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BRITISH MARINE DIESEL IS MADE FOR SMALL BOATS

Perkins three-cylinder marine Diesel with hand-starting is designed for small craft. Developing 30 bhp at 2000 rpm, it has a displacement of 144 cu in. with 3 1/2-in. bore and 5-in. stroke. A choice of three gearbox reduction ratios is available. Optional cooling systems include direct sea, keel pipe, heat exchanger, and radiator.

Continuing Losses Fail to Dim AMC Confidence

American Motors Corp. remains openly optimistic about its chances for survival in the highly competitive arena of automotive manufacturing. In spite of a loss of \$2,994,613 in the quarter ended Dec. 31, 1956, company officials at the annual meeting in Detroit early this month stated that prospects continued favorable. Profitable operations in the car divisions for October and December of last year were cited to make the point.

The loss for the December quarter was incurred on sales totaling \$88,903,414. By comparison, sales for the like quarter of 1955 were \$99,180,965 with an operating loss of \$4,629,352.

Presiding over the meeting in place of AMC president George Romney (recovering from an appendectomy) was Richard E. Cross, a director. He read to the shareholders a statement from Mr. Romney to the effect that American Motors has rejected suggestions that it merge with another company at this time or liquidate its assets. However, he said that any

practical merger possibility would be received with an open mind.

Disposal of the company's assets, Mr. Romney emphasized, would be imprudent for a number of reasons. He mentioned as just one example American Motors' accumulated loss carry-forward tax credit of \$36 million.

Providing the expected fireworks at the session was Detroit attorney and stockholder Sol A. Dann. Speaking in militant fashion, Mr. Dann outlined his own program for a complete shake-up of American Motors. Involved would be: a complete reorganization of the company; removal of many of its present officers; discontinuance of the Metropolitan Hudson, and Nash lines; closing of the Milwaukee body plant; more concentration on Rambler production at Kenosha; study of further diversification; and an all-out effort, as an alternative to the foregoing, to merge AMC with some other concern.

Mr. Dann, however, found little

support among his fellow shareholders for his program. It was announced at the opening of the meeting that over 70 per cent of the outstanding shares had given their proxies to management.

In summary, AMC management apparently remains convinced that "the turn in the road" is just ahead in its battle to retain and strengthen its position as an independent automobile manufacturer. There seems little doubt that the appliance end of the business will continue to prosper.

Attainment of an estimated breakeven point in operations with sales of 150,000 cars a year should make a big difference in the corporation's overall picture, it is felt. Spearheading this drive, of course, will be increased emphasis on the Rambler as the "bread-and-butter" product.

Solar to Build Components Of J75 Jet Engine for Ford

Solar Aircraft Co. has been awarded an Air Force contract for \$1.3 million worth of production facilities for J75 jet engine components. The 15,000-lb thrust engine was designed by Pratt & Whitney Aircraft Co.

Solar's Des Moines plant will build components for the engine in production quantities for the Aircraft Engine Div. of Ford Motor Co. Ford is manufacturing J75's under license from Pratt & Whitney.

New V-8 Engine Scheduled For '58 By One Car Maker

At least one new V-8 engine is scheduled for 1958 models in one of the Big Three volume lines. Principal changes in the engine are larger displacement, plus engineering refinements. Tooling already is under way.

Dodge Notes Sharp Increase In Air Conditioning Orders

Sales of air conditioning units for automobiles are edging upward. This is evidenced in a report from Dodge, which shows that it already has received nearly as many orders for 1957 cars equipped with air conditioners as it did during the 1956 model year.

AND AVIATION INDUSTRIES

Cole Emphasizes Growth of Postwar Truck Market

Growth of the motor transport industry and engineering developments made on trucks in the postwar period were emphasized recently by E. N. Cole, Chevrolet general manager. Since 1946, Cole noted, the industry has been producing more than one million commercial vehicles a year. There was only one other year prior to that when the industry hit the one million mark. That was in 1941, when 1.06 million trucks were built.

Chevrolet, Cole observed, today sells between 100,000 and 200,000 more trucks a year than it did in an average prewar year. Postwar truck output at Chevrolet passed the 4 million mark the latter part of 1956, about 850,000 more than any other make.

Commenting on truck developments since the end of the war, Cole recalled that only two engines and two transmissions were available on the first postwar Chevrolet truck. The models came in gross vehicle weights ranging from 4000 to 16,000 lb. Today, eight different engines and the same number of transmissions are offered, including two automatic units. Gross vehicle weights range to 36,000 lb.

Martin Prepares to Turn Out Lacrosse All-Weather Missile

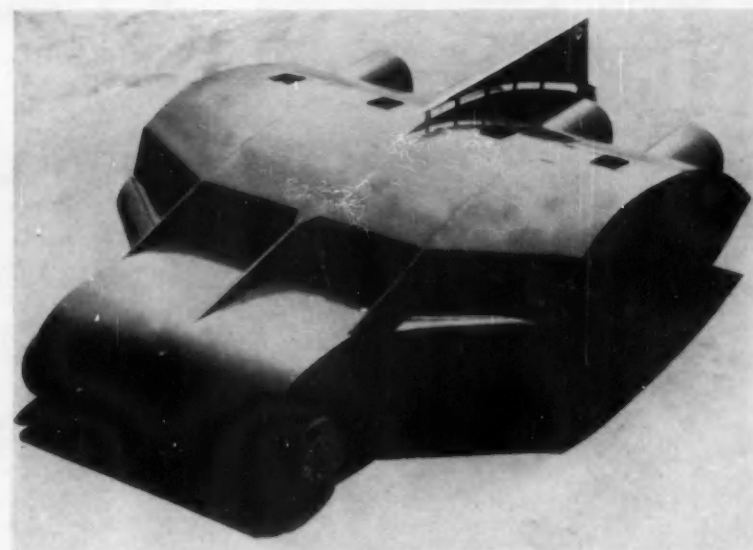
The Army and Martin Aircraft have announced a new production contract for the Lacrosse surface-to-surface field artillery guided missile.

Lacrosse is an all-weather missile capable of destroying enemy strong points in the field to supplement air or artillery attack. Essential components are the missile, a launcher mounted on a standard Army truck, and a guidance system. It is propelled in flight by a solid fuel rocket motor.

Budd Sales and Earnings Off Slightly from 1955 Figures

The Budd Co. earned \$9,165,274 on sales of \$307,829,326 in 1956. These figures, subject to year-end audit, compare with earnings of \$13,790,578 on sales of \$316,572,778 in 1955.

Reasons given for the lowered sales



JET-POWERED CAR TESTS AIRCRAFT ARRESTING GEAR

This jet car was developed by All American Engineering Co. for the U. S. Navy Bureau of Aeronautics to test aircraft arresting gear. Powered by four Allison J33-A16 turbojet engines, it roars down a test track at 200 mph or more pushing in front of it dead loads. These are slammed into arresting gear to test the strength of the gear and its capability to absorb the energy of a landing jet fighter or bomber.

and earnings are three-fold: (1) over production in the automobile industry, which caused a severe cutback during the second quarter; (2) the fact that the 1957 models were slower than usual getting into full production in the fourth quarter; and (3) a month-long strike at the Budd Red Lion plant in Philadelphia during the fourth quarter.

UAP to Use Former NAF Plant For Sheet Metal Fabrication

United Aircraft Products, Inc., has announced a \$1 million expansion program. It embraces purchase and equipping of a new plant for sheet metal fabrication in northwestern Ohio and changes in production operations at its headquarters plant in Dayton, O.

The company has completed the purchase for an undisclosed price of the former National Automotive Fibres, Inc., plant at Forest, O. The Detroit concern ceased manufacture of automotive upholstery in the two-year-old plant six months ago.

Caterpillar Ups Outlay For Expansion Program

Caterpillar Tractor Co. has boosted its four-year spending program to \$500 million from \$400 million to meet the needs of a broader road-building plan.

Projects now under way and those planned for the near future include a research center, general office and industrial engine plant north of Peoria, Ill.; a plant for crawler tractors at Aurora, Ill.; a parts department building at Morton, Ill.; additional parts department facilities at Denver, Colo.; and a new emergency parts service plant near Toronto, Canada.

GM Paid Out \$3 Million Under Suggestion Plan

General Motors last year paid a record \$3 million to employees for ideas it adopted in its operations. Of the 234,796 suggestions submitted during the year, 55,338 were used.

(Turn to page 94, please)

Meeting the big change in cars with the big change in bearings:

TIMKEN® and The Moto-Mated Way



Revolutionary new mass production methods roll out millions of bearings... at lower cost

THE big change in today's cars places new demands on component parts. To meet the big change, the Timken Company introduces a whole new concept in bearing design, manufacture and supply. A concept mated to the changing needs of the automotive industry. It's the Moto-Mated Way.

Started in a uniquely modern mass production factory in Bucyrus, Ohio, the Moto-Mated Way recements our forward-looking partnership with your industry by: 1) Anticipating your changing needs, 2) Putting advanced machines to work for you, 3) Bringing you a better, more uniformly precise product at lower cost, and 4) Assuring you a virtually unlimited supply of bearings when you want them. (That's why we've just built the \$2 1/2 million Shipping Center, pictured above, at Bucyrus.)

Out of the Moto-Mated Way comes a

new breed of Timken® tapered roller bearings in 13 standardized sizes, mass-produced by the millions. New, lighter bearings to reduce unsprung weight, improve ride; smaller bearings to save space—permit more compact designs; capacity-packed bearings to take the loads of today's cars. And bearings, lower-priced than previous designs.

Already, automakers are saving 14.6% on millions of Moto-Mated bearings in front wheels of 1957 cars. And even greater economies will be possible when you find new uses for these new Timken bearings in rear wheels, pinion and differential.

Why substitute, when you can get the very best at low cost? Now, more than ever, Timken bearings are your No. 1 value. The Timken Roller Bearing Co., Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "Timrosco".



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TAPERED ROLLER BEARINGS

YOUR NO. 1 BEARING VALUE

Men in the News



Chrysler Corp. — Harry E. Chesebrough was named director of product planning.

SKF Industries, Ind.—Adolph G. Abramson has been appointed director of economic planning; James H. Sutherland, director of sales; and Edward H. Wagner, Midwestern regional sales manager.

Verson Allsteel Press Co.—Rear Adm. William O. Gallery (USN, Ret.) was named vice-president of administration, and Melvin D. Verson was made vice-president of marketing.

Coolidge Corp.—Robert B. Freeman was named works manager, and Robert F. Miller was made sales engineer.

Ex-Cell-O Corp., Industrial Div.—Jack L. Mustard was made sales manager.

Baker-Raulang Co.—R. B. Vawter has been named manager of industrial relations.

Sahlin Engineering Co.—William H. Uren has been appointed operations manager.

Ford Motor Co.—Robert Stevenson was appointed chief engineer, product engineering office; L. L. Beltz, chief engineer, electrical engineering; H. C. Grebe, chief engineer, product engineering office; and H. G. English, chief engineer, product engineering office.

Borg-Warner Corp.—J. F. Weiffenbach was appointed director of research and engineering.

American Felt Co.—Thomas J. Gillick, Jr., was named manager of the Engineering and Research Div. and Harold G. Hencken succeeds him as director of engineering activities.

Chrysler Corp., Engineering Div.—Alan G. Loofbourrow was named executive engineer for product development and planning; H. R. Steding, executive engineer for product programming; and Robert Anderson, executive engineer for car chassis, electrical and truck engineering.

Firestone Tire & Rubber Co.—Lee R. Jackson was elected vice-chairman of the board; Raymond C. Firestone, president; James E. Trainer, executive vice-president; Harvey H. Hollinger and John L. Cohill, vice-presidents; and Elton H. Schulenberg, treasurer.

Kelsey-Hayes Co.—L. E. Dalton was elected vice-president in charge of manufacturing.

Brush Electronics Co.—Maurice R. Eastin has been appointed general sales manager.

Rochester Products Div., General Motors Corp.—James F. Bittle has been made director of work standards and methods.

Clearing Machine Corp.—Ervin J. Baumrucker was appointed general sales manager, and F. W. Dorenbos was named assistant chief engineer.

Ford Motor Co.—Robert J. Eggert is now marketing research manager for the Marketing Staff.



Pangborn Corp. — Victor F. Stine has been elected president.

International B. F. Goodrich Co.—Alex L. Semegen has been appointed advertising manager.

Bullard Co.—John A. Coe has been elected to the board of directors.

Pangborn Corp.—Ralph M. Trent is now executive vice-president; W. O. Vedder, vice-president; and John C. Pangborn, vice-chairman of the board.

Ford Motor Co., Aircraft Engine Div.—R. A. Powley has been appointed division assistant general manager, and John A. McCabe has been named general manufacturing manager.

U. S. Axle Co., Inc.—Elizabeth L. Watson has been elected president; Arnold Watson, treasurer; Edward D. Gudebrod, vice-president; and George M. Longaker, secretary.

Willys Motors, Inc.—R. J. Kreusser is now fleet sales manager.



Ford Motor Co. — William J. Moriarty has been appointed styling operations manager.

Eaton Mfg. Co.—Raymond R. Dirksen has been made assistant sales manager of the Dynamatic Div.; Thomas A. Moretti, acting plant manager of the Marion Forge Div.; and Joseph R. Teagno, director of the patent section.

Edsel Div., Ford Motor Co.—Norman K. VanDerzee has been named assistant general sales manager for marketing, and J. Emmet Judge has been made merchandising and product planning manager.

(Turn to page 94, please)

Necrology

Charles H. Davis, 87, one-time vice-president of the old Durant Motor Car Co., died Jan. 24, at Lansing, Mich.

Vaughn Bell, 68, former director of industrial relations for Bell Aircraft Corp., died Jan. 21, at Santa Monica, Calif.

Carl Byoir, 68, founder of the well-known public relations firm bearing his name, died Feb. 3, at New York, N. Y.

Alexander W. Whiteford, 83, retired sales executive for Union Carbide and Carbon Corp., died Jan. 23, at Bronxville, N. Y.

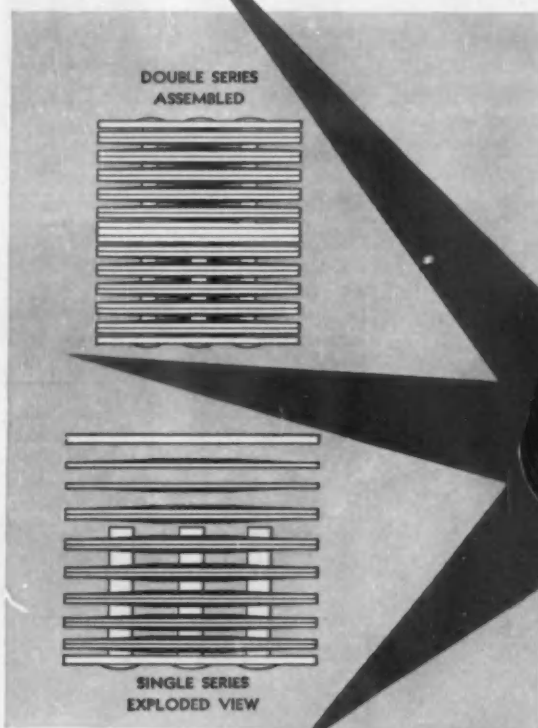
Arthur L. McCurdy, 68, pioneer Canadian aircraft builder, died recently at Toronto, Ont.

Frank M. Davis, 91, automotive production equipment inventor, died recently at Stoughton, Wis.

Nathaniel S. Reeder, 81, retired vice-president and director of Pressed Steel Car Co., died Jan. 20, at New York, N. Y.

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COMPACT**

Energy Cartridge*



for high loads at
minimum deflection

DESCRIPTION

This new cartridge* provides a compact stack of pre-assembled Belleville washers, a solid, one-piece unit—easier to handle and install than loose washers. The washers are held together with face plates and pins or rivets at or near the neutral axis. Washers may be assembled in series, parallel, and parallel-series according to space and load requirement. Eliminates manual hazard of assembling in wrong sequence at assembly point.

*Reg. U.S. Pat. Off.

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TO BETTER WIRING

AMP's NEW Button Contact with Insulation Support

Improved
Tensile
Strength
and
Vibration
Resistance



- Especially designed to give added reliability for automotive and appliance light sockets (applications where vibration can cause the conductor to ground or break at the connection).
- Replaces all button-type contacts presently in use.
- Raised contact section assures positive registry.
- Chamfered edges permit easy rotation of bulb when locking into twin contact socket.
- Applied by high speed AMP Automatic machines using the revolutionary Keystone Serrated solderless crimp.
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An Even Better

WITH THE SAME



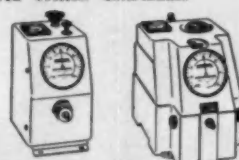
IMPROVED ZERO SETTING

The zero setting adjustment is improved mechanically. The pointer is set directly to zero — positively, without additional adjustment.

NEW PROTECTION FOR AIR METER

A new piping arrangement assures effective protection of the Air Meter from dirt, oil and water.

ONE THIRD SMALLER



Compact, easy to handle — more adaptable for use on machine tools. Beautiful, dirt-resisting finish.

NEW IMPROVED REGULATOR (At Top)

A better and smaller regulator assures constant air pressure and enables a reduction in size of the complete gage. Setting can be locked to prevent accidental change of zero setting.

FINGER TIP ATTACHMENT OF GAGING UNITS

Knurled collar attaches all gaging units quickly: one hand only required. "O" Rings assure air-tight connection. No wrenches needed.



ONLY AIR GAGE WITH BUILT-IN ACCURACY THAT ENABLES USE OF ONE MASTER



BETTER FILTER with TRANSPARENT BOWL

New sintered bronze element filters out dirt and coagulated oil. Condition of air lines can be readily checked by observing filter bowl. Attached directly to gage, it eliminates extra piping.



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One-piece top and front easily removed with all components and connections attached. Quick, easy servicing, if necessary.

DIMENSIONAIR

BASIC, NO-DRIFT SYSTEM

The Dimensionair system is basically sound in principle. Its accuracy is proved constant and dependable every day in practice.

However, no gage maker can control all the elements, human and technical, that influence the proper use of his product but he can incorporate features which tend to eliminate these faults and improve the actual use of his instruments.

That is the purpose of these new refinements which have been built into the Dimensionair.

Most air lines installed in plants were NEVER INTENDED to be used for precision instruments of any kind. Hence, the Dimensionair is now made EVEN MORE IMMUNE to unclean air and variations in air pressures.

Adjustments are more foolproof.

Smaller size makes the gage EASIER TO HANDLE and increases its adaptability for general use . . . and for multiple use.

Since any instrument is subject to all degrees of treatment it must be EASY TO SERVICE when the unusual or unexpected upsets its normal function. In the new and smaller Dimensionair all components and connections are quickly and easily accessible.

In every way the Dimensionair provides you with constant accuracy and GREATER DEPENDABILITY, adaptability and service. That's why more and more inspection people buy it. Why don't YOU try it? Write or call us at our nearest office.

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per piece with
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of small parts

■ In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching, in many fields.

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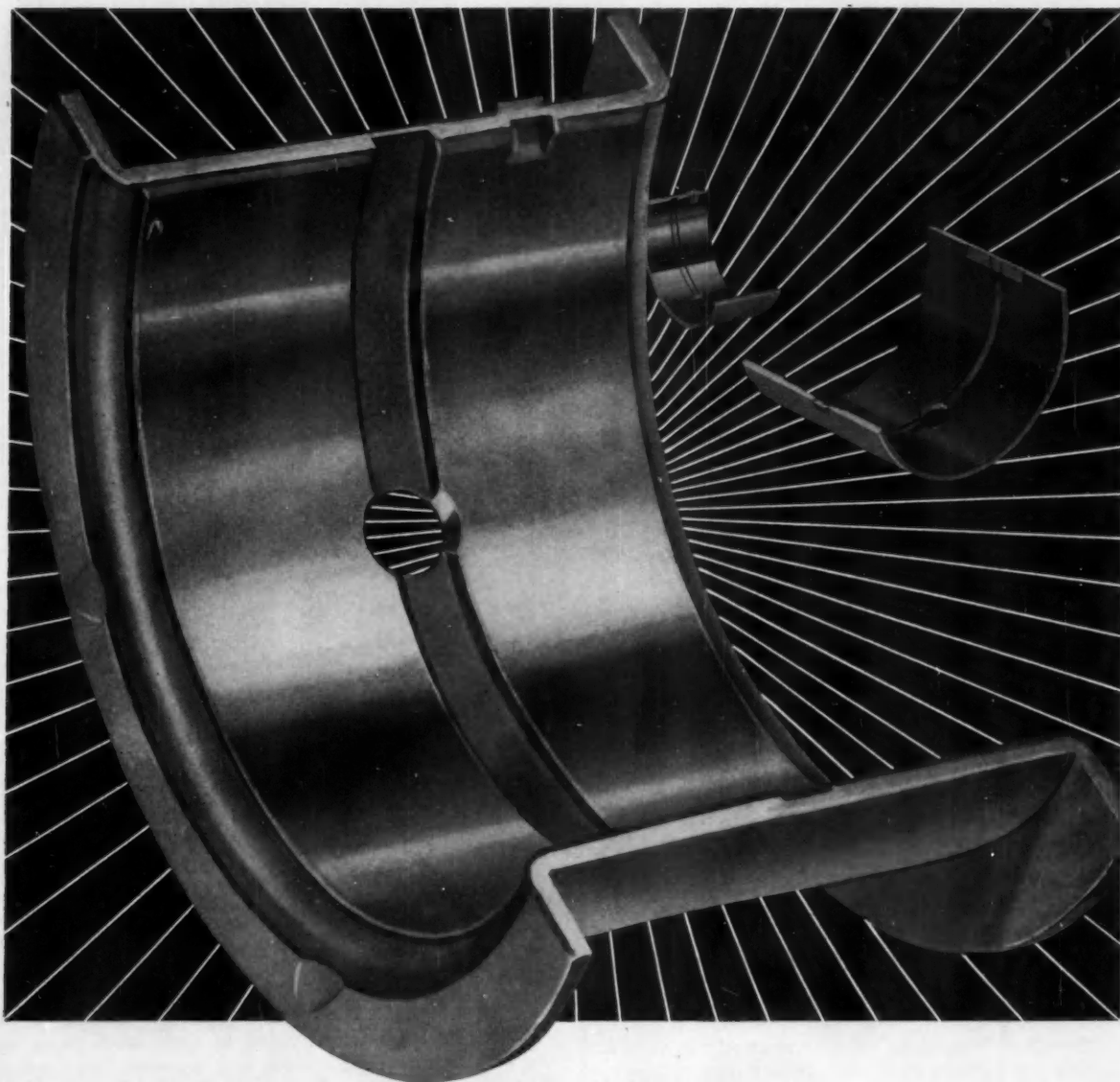
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There's been a revolution going on under the surface!

Sleeve bearings have *looked* much the same for 50 years. But there the resemblance ends. Take this modern bearing, for example. It has a steel back, a sintered layer of copper-lead alloy, a brass barrier plate and a lead-tin overplate. It's a far cry from the simple babbitt bearings of the past—but so are the load, speed and

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RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

AUTOMOTIVE INDUSTRIES, February 15, 1957

Special Fasteners Can Cut Costs

By Kenneth Rose



Battery of Boltmakers at new plant at Cleveland Cap Screw Co. located five miles southwest of Cleveland

Close-up of a Boltmaker in operation at Cleveland Cap Screw Co. Heavy wire is drawn in at far right of machine.

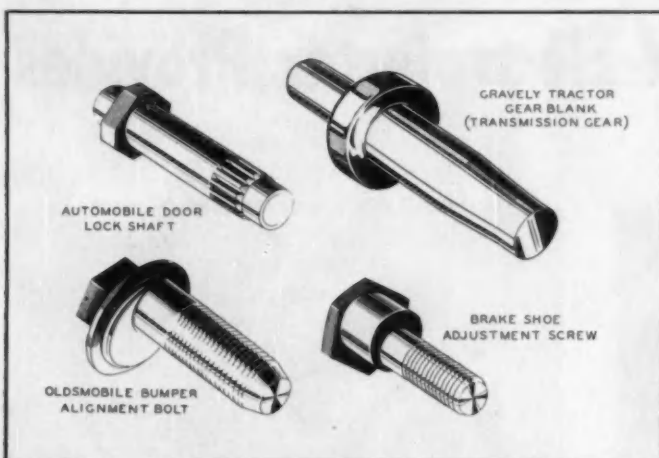


THROUGHOUT industry there is a strong trend toward standardization of such small parts as bolts and cap screws, and concentration upon a minimum number of sizes. This can effect considerable reduction in inventories, with the attendant savings. Use of standard parts also makes servicing somewhat easier in the field.

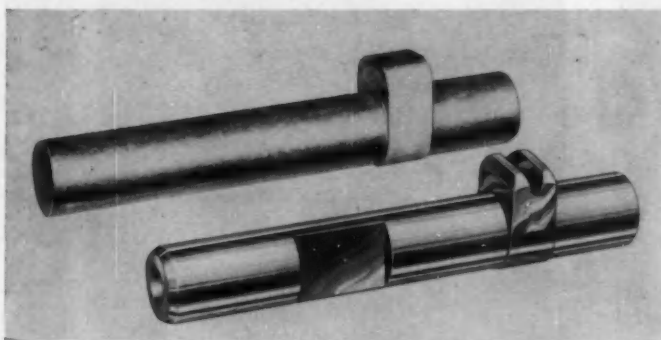
There are other factors, however, that may dictate the use of a special headed and threaded fastener for a given application in spite of the advantages of standardization. Cost savings can sometimes be made, the higher first cost of the special fastener and the cost of stocking an additional piece notwithstanding. Use of the special fastener then becomes a matter of economy.

In general, applications in which a special fastener competes economically with a standard fastener are those in which it meets some special service condition or performs some function in addition to its primary one of fastening. These might be classified as follows:

(1) Multipurpose applications. It sometimes happens that a fastener can be redesigned so as to serve where several fasteners, or a fastener and one or



Special automotive components which were formed in cold-forging machines.



Two steps in the production of an implement rack gear. Extruded gear blank is shown above; finished, slotted gear can be seen below.

more other pieces, were formerly used. An example of this is the Place bolt, in which the head is designed to perform the functions of a lock washer.

(2) Special sizes. Very large sizes, or very small sizes, or non-standard lengths, may be required by the design of a mechanism.

(3) Special materials. Fasteners may be made of special alloys and heat treated for high strength, or of a chemically resistant alloy, etc. Aircraft fasteners, for example, are frequently heat treated to obtain a high yield strength.

(4) Special functions. A piece may be designed to perform some function other than joining materials, along with its function as a fastener. An example of this is an automotive fastener in which a levelling cam is designed into the piece.

By forming the pieces in high-production cold-forging machines referred to as Boltmakers, Cleveland Cap Screw Co., manufacturer of standard and special cap screws, keeps costs to a minimum and obtains the improved strength properties of cold-worked metal. Where the part is to be heat treated after forming, the cold-worked properties are super-

sed by the subsequent heat treatment.

Cleveland Cap, recognized in the industry as developer of the cold-forging double-extrusion process, is an affiliate of the Standard Pressed Steel Co., Jenkintown, Pa., which also has plants in Pennsylvania, California and England.

The Place bolt, used in the automotive industries when a locking feature is needed to prevent loosening under vibration, is a patented fastener in which the head is thinned out to permit some deflection when the bolt is tightened and the head bears upon the surface of one of the joined members. There is some relief on the underside of the head, so causing the deflection to serve for locking the fastener. Place bolts are used for such applications as flywheel fasteners and main bearing cap screws.

For applications such as earthmoving equipment and other heavy vehicles, large socket head and hex head cap screws, 2 in. to 2½ in. by 12 to 14 in. in length are produced, some of them in SAE 4140 heat treated steel for high strength. In these large sizes the heads are hot formed. A Class 3 fit is standard in many of these highly stressed parts.

An interesting example of how a fastener can be designed to serve a special function, in addition to its primary purpose as a joining member, is the camming fastener designed for a leading automobile manufacturer. The problem here was to attach the bumper to the car frame, and to adjust the two sides so

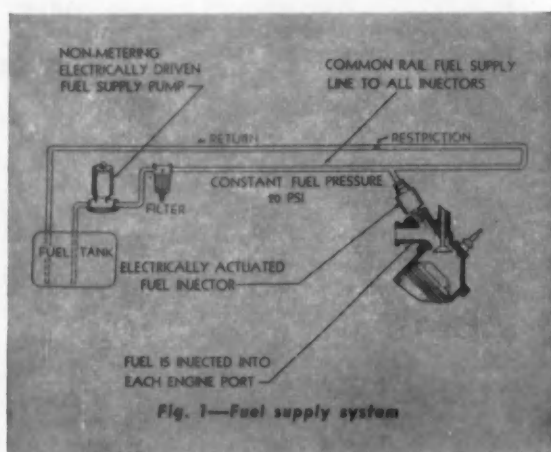
that the bumper would be level. This was done by attaching the bumper with an ordinary bolt through an oversize hole, leveling and then drawing up tight. The adjustment was time-consuming, and was not very secure when made.

The special fastener designed for this application is made with an eccentric head, so that the bumper can be raised or lowered about 3/16 in. at either end. The material used is SAE 1018 steel, spheroidized before forming, as coils of 9/16-in. wire. After forming, the piece is stress relieved, and the threads are then rolled on. When the bumper is being attached to the car frame with this fastener, it can be raised or lowered by 3/16 in. at each end by means of the eccentric head. This greatly simplifies leveling and makes the final assembly more secure. It is given a rust-resisting plate of cadmium or zinc before assembly.

Another joining member, though not strictly a fastener, is a lock shaft for an automobile door. This is made by a combination of cold forming processes, using SAE 1018 steel. A splined section near one end

(Turn to page 106, please)

The Bendix Electrojector Provides



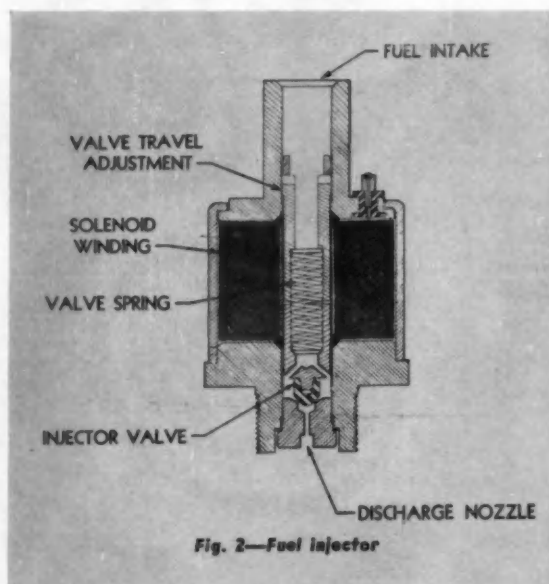
THE Bendix Electrojector is an electronically controlled and electrically actuated fuel injection system designed for use on any passenger car engine. It has timed intake port injection and a low-pressure (20 psi) common rail fuel system. Its control system responds to intake manifold pressure, engine speed, air pressure, and temperature.

The basic fuel supply system (see Fig. 1) consists of an electrically driven, non-metering, fuel supply pump; a fuel filter; and a fuel injector valve for each engine cylinder. The fuel pump maintains the line pressure to each fuel injector valve at 20 psi, plus or minus $\frac{1}{2}$ psi. Since the system does not have close fitting mechanically operating units, it is not necessary to filter particles finer than 20 microns.

In the Electrojector system, fuel is directed at the head of the intake valve so that a minimum of wall wetness results. A fuel return line continually purges any air or fuel vapor from the supply system. To date, there has been no engine malfunctioning due to air or fuel vapor, even though the system has been subjected to high underhood temperatures and (during a shut-down period) to empty fuel lines.

A more detailed picture of the solenoid fuel injector valve is shown in Fig. 2. Fuel enters at the top of the unit, passes through the center core of the valve, and is discharged through the nozzle at the lower end when the injector valve is off its seat or is open.

The Electrojector timing system includes a standard engine distributor to which a fuel injection triggering selector unit and rotor have been added. The selector unit and rotor are inserted as a sandwich between the base of the distributor and the standard ignition dis-



tributor cap. The triggering selector unit consists of a set of breaker points and a distributing commutator, with a section for each solenoid injection valve.

The breaker points are actuated by the same cam that operates the conventional engine ignition points. Thus, for each two revolutions of the engine, the fuel injector breaker points make and break contact as many times as there are cylinders in the engine.

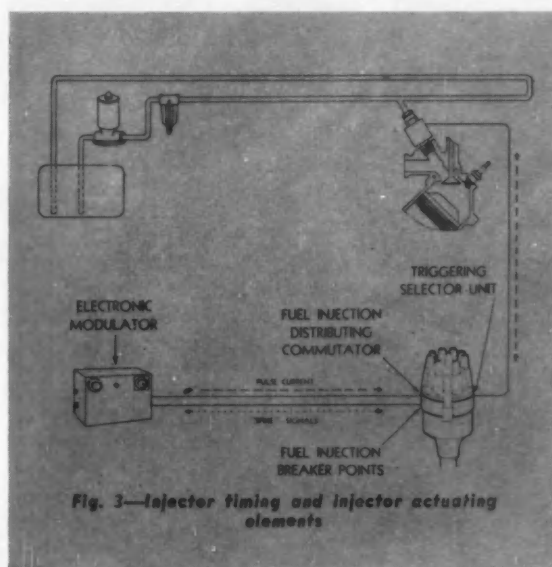
Each time the injector breaker points make contact, a triggering impulse is transmitted to an electronic modulator box, which is the heart of the control system. The signal is modified and then returned to the selector portion of the assembly, which distributes it to the correct fuel injector valve.

Fig. 3 shows how the electronic modulator control and the triggering selector units are arranged in the system. Through the triggering selector unit, engine speed and fuel injection timing are sensed and an electrical impulse is correctly distributed to the individual fuel injectors.

The transistorized electronic modulator control transforms the spike signals it receives from the triggering selector unit into an electrical pulse of a given standard width. Simultaneously, sensing elements located on various parts of the engine send out signals indicating engine operating conditions. The modulator control integrates these signals into the standard pulse width circuit and then transmits the modified electrical

Timed Intake Port Fuel Injection

By A. H. Winkler and R. W. Sutton
FUEL SYSTEMS ENGINEERING DEPT.
ECLIPSE MACHINE DIV.
BENDIX AVIATION CORP.

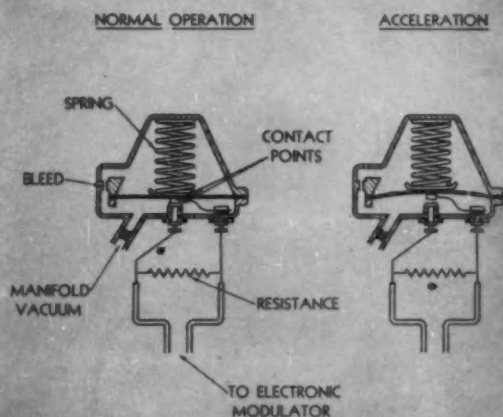
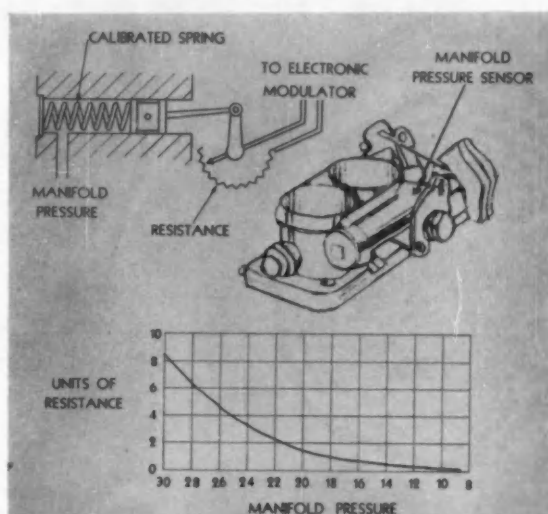


pulse to the selector portion of the triggering selector unit which—to repeat—directs the pulse to the correct fuel injector.

The external sensing elements consist of an intake manifold pressure sensor, deceleration cutoff sensor, starting enrichment control, idle mixture enrichment control, altitude compensator, and accelerator enrichment control. These modulating or sensing circuits introduce added resistances into the fundamental circuit to modulate the width of the standard pulse. As the sensing circuits resistances increase, the pulse widths increase and the length of time the injector valve is held off its seat likewise increases, resulting in additional fuel flow. Standard type (but larger) throttle valves are used to control air flow to the engine.

Here is how the various sensing elements work:

The intake manifold pressure sensor, which is attached to the throttle body, indicates the relative density of the air charge entering the engine. Fig. 4 shows schematically the operation of this sensor. The



actual resistance characteristics will vary for different makes and models of engines.

The manifold vacuum change sensing device for acceleration enrichment is illustrated in Fig. 5. In operation, a rapid change in vacuum manifold causes the points to separate, introducing an additional resistance into the control system. This increases the operating pulse width of the electrical signal for the length of time necessary to equalize the pressure in the cham-

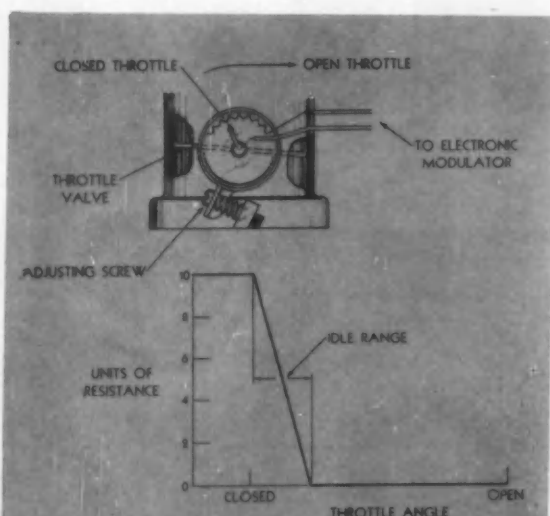


Fig. 6—Idle enrichment

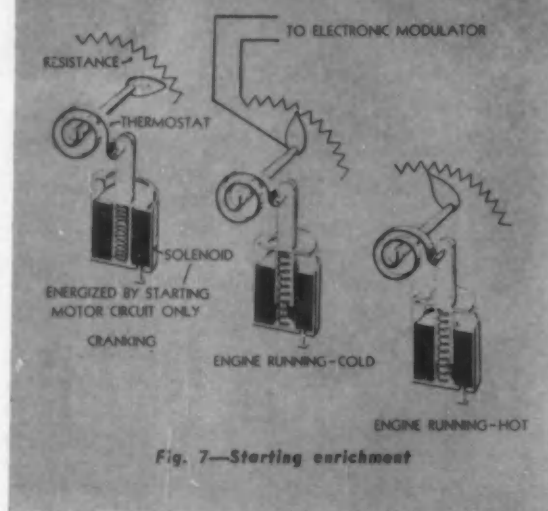


Fig. 7—Starting enrichment

bers located on both sides of the unit diaphragm.

The idle enrichment control, shown in Fig. 6, consists of a rheostat connected to the throttle shaft, which interjects a variable resistance in the control circuit when the throttle is in the idle position. The idle adjustment is obtained by adjusting this resistance instead of the conventional idle mixture adjustment needle.

The starting enrichment control is illustrated in Fig. 7. Cold weather starting tests show that it is necessary to supply more fuel to the engine during the cranking period (per engine cycle) than is necessary to operate it after the start, and that the quantity of fuel required will vary with engine temperature. To accomplish this, during engine operation, a thermostat

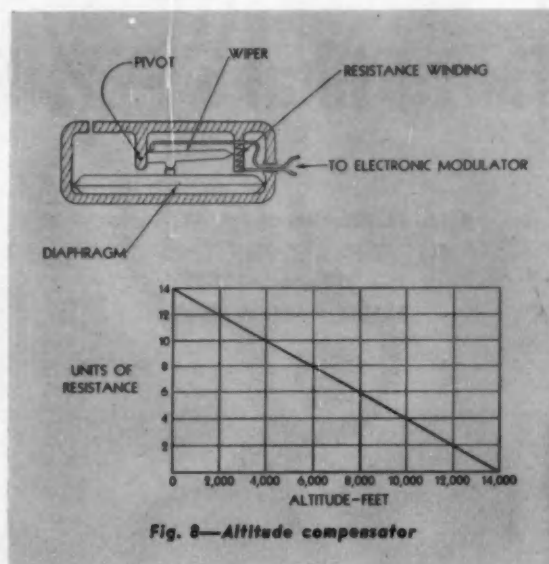


Fig. 8—Altitude compensator

positions a variable resistance as the ambient temperature decreases, thus increasing the width of the electrical pulse. To obtain the added fuel flow necessary during the cranking period, an electric solenoid operating through the thermostat repositions the rheostat to a higher position during the cranking period. Since the thermostat reflects engine temperature, the amount of enrichment decreases as the engine warms up.

It has been found advantageous to cut off the fuel flow to the engine during deceleration, when the manifold vacuum is abnormally high. Since fuel flow modulation in the Bendix Electrojector system is partially controlled by manifold vacuum, fuel cutoff is attained when the vacuum exceeds a predetermined value. With the fuel injectors located adjacent to the intake valves, there is very little, if any, fuel carryover from the manifold; thus a clean cutoff is effected.

An automatic altitude compensator sensing unit is attached to the electronic modulator box. Fig. 8 schematically illustrates a configuration of such an altitude compensator, which includes a small aneroid with a variable resistance unit that transmits its signal to the modulating unit.

To summarize, the cycle of operation is as follows: As the engine rotates, the injector breaker points send out spike signals in time with the opening of each intake valve. These signals trigger the multi-vibrator circuit in the electronic control box, which sets up a series of pulse currents tuned to a standard pulse width. The standard pulse segments are then modified by the various modulating or sensing circuits. The modified signal is then transmitted to an amplifier, which amplifies it to the power needed to actuate the solenoid injector valves. The amplified pulse is then directed to the selector, where it is distributed to the proper fuel injectors, just as an ignition current is distributed to the various spark plugs. The injectors

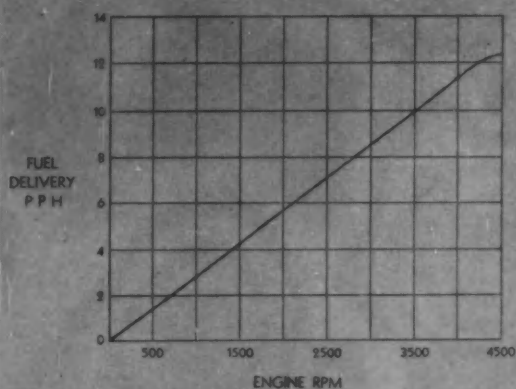


Fig. 9—Fuel delivery per injector at constant pulse width

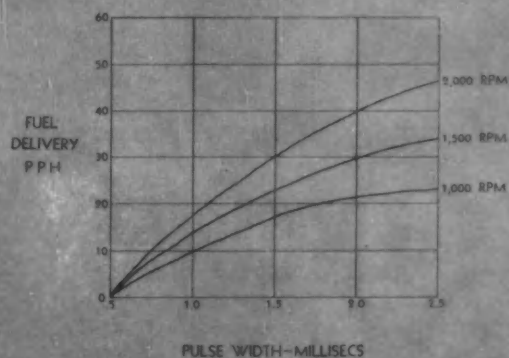


Fig. 10—Fuel delivery increasing with pulse width per injector valve

then react to the power impulse, causing the valves to lift from their seats and to permit the required fuel to flow to the cylinders.

The Bendix Electrojector system maintains a constant pulse width during full throttle operation and this results in a fuel delivery that is proportional to engine speed through the major portion of the speed range, as indicated in Fig. 9. At engine speeds above approximately 4000 rpm, there is a slight fall off in the fuel delivery curve. Fortunately, a similar trend is noticed in engine air consumption.

When the pulse width is varied, fuel delivery over the speed range will increase with increasing pulse widths. However, fuel delivery is not directly proportional to the pulse widths, but assumes a characteristic curve as indicated in Fig. 10. The actual shape of the fuel curve with varying pulse widths and at constant engine speed is a summation of the various electrical, flow, and motion characteristics of the units in the system.

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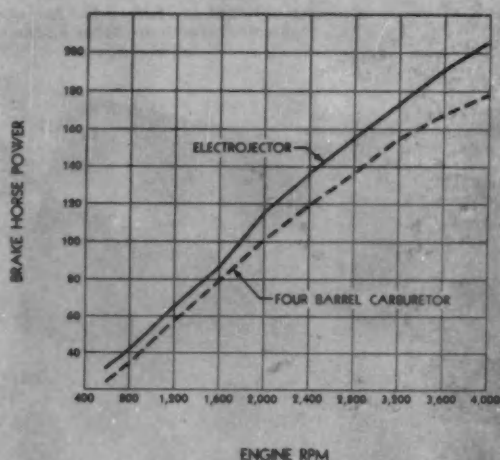


Fig. 11—Typical test results

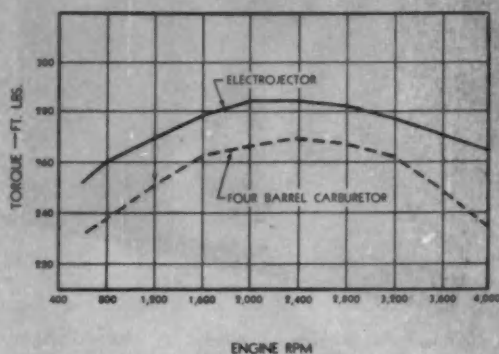


Fig. 12—Typical test results

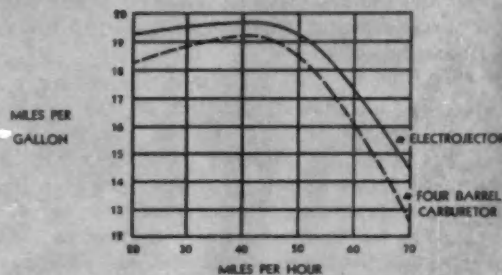
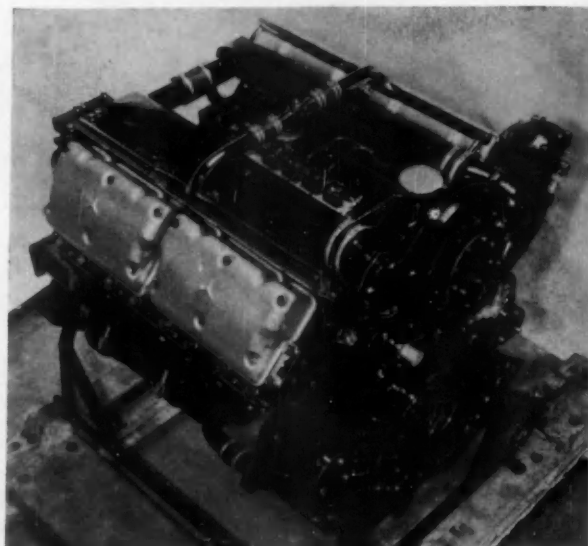


Fig. 13—Road economy tests

Mercedes-Benz V-8 Diesel rated at 600 hp at 2200 rpm. It has a displacement of 1826 cu in. The super-charged engine operates on the four stroke cycle.



Prestige model of the Scott-Atwater line is the 40 hp Royal Scott. It features turn-key starting and an electric fuel pump.

Lighter, Higher Powered **ENGINES**

at

NATIONAL MOTOR BOAT SHOW

MOST of the outboard motor and inboard engine makers brought out either new or improved models for the National Motor Boat Show held in New York City last month. With both classes of engines, the emphasis was on improved power weight ratio. Practically, all makers have turned to 12v electrical starting systems.

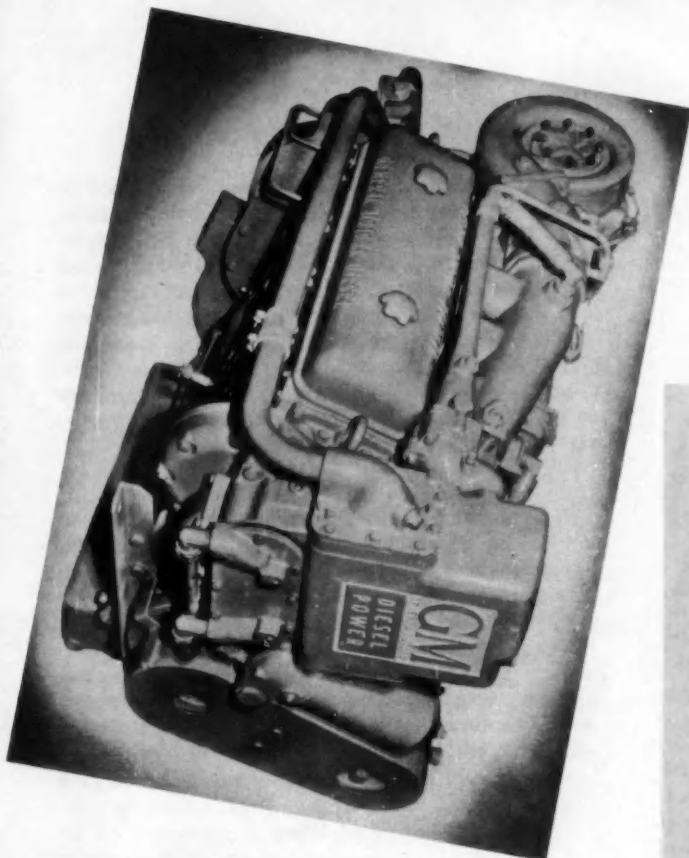
Outboard motor makers stressed new styling, prestige models, and ease of operation as well as higher power. With the inboard engines, the major sale point was based on increased horsepower with less weight and better economy. Diesels have been lightened up, turbocharging is being used, and the overall power range has been extended from three to 600 hp. With the gasoline engines, the V-8 was prominently displayed by several makers. Compression ratios have been increased, engine speeds are up, and there were more oversquare models.

Allis-Chalmers

This company featured the 6DAMR-273, six-cylinder Diesel. It delivers 85 shaft hp at 2800 rpm and weighs less than 1000 lb complete with marine gear. The engine has a 3¼ in. bore and a 4½ in. stroke providing a total displacement of 273 cu in. In addition to the sale of engines at the Show, the company was promoting its dealerships by providing visitors with a map showing Allis-Chalmers dealers in every locality.

Cadillac Crusader

Using a V-8 Cadillac engine block and Simmonds fuel injection, the Cadillac Crusader Marine Engine Div. of Cal Connell Cadillac Corp., exhibited an engine said to produce well over 300 hp. The engine has a compression ratio of 10 to 1 and turns up to 4600 rpm for maximum power. It uses a roller tappet camshaft,



This Detroit Diesel inclined turbocharged four-cylinder Diesel was shown for the first time. At 2300 rpm it delivers 197 shaft hp.

log type water cooled exhaust manifold, and a thermostatically controlled oil cooler.

Chrysler

Oversquare V-8 engines were the feature of the Chrysler marine line. Top engine in the line is the Imperial V-275 which puts out 275 hp at 4400 rpm. Hemispherical combustion chambers are used in the 354 cu in. engine. Compression ratio is 8.2 to 1. Bore and stroke are 3 15/16 in. by 3 5/8 in. Other V-8 models in the line range from 155 to 225 hp. All are equipped with sodium cooled valves, twin concentric valve springs, water heated intake manifold, mechanical valve tappets, and a dual pocket water pump.

Daimler-Benz

Four Diesel engines ranging in power from 34 to 600 hp were shown by this firm. The 600 hp Mercedes-Benz engine is a V-8 of 1825 cu in., water-cooled, four stroke unit weighing about 3000 lb. It develops 300 hp at 1000 rpm and 600 hp at 2200 rpm.

Dearborn Marine

Some basic improvements have been incorporated in the entire line of inboard gasoline marine engines produced in 125, 145, 165, 185 and 215 hp models.

Chrysler's Imperial V special V-8 gasoline engine with hemispherical combustion chambers.

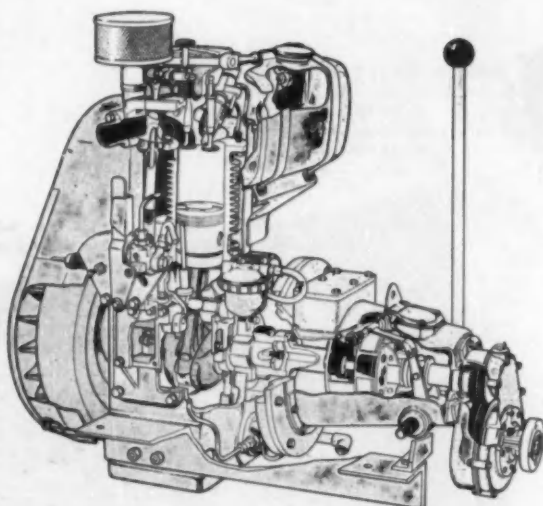


Automatic chokes have been re-engineered to improve starting. New oil pumps to maintain constant pressure from idling to full throttle are now being used. A low level safety arrangement halts continued operation of the engine at high speeds whenever the oil level is down. The entire carburetion system of the Interceptor engine nests in the vee of the cylinders. All of the engines are of the short stroke type with compression ratios up to 9.4 to 1 and operating speeds up to 4000 rpm. Capitol transmissions and reduction gears are now available along with Dearborn's hydraulic units.

Detroit Diesel—GM

Turbocharged Diesel engines featuring a 17 per cent increase in horsepower or a 15 per cent reduction in fuel consumption are the latest thing in the GM line. The company claims that the better performance is obtained with no increase in weight to power ratio. Detroit Diesel is now offering three cylinder and four

By Thomas Mac New



Cutaway view of Petter single cylinder, six-horsepower, aircooled Diesel.

cylinder models in the Series 71 line for small craft. The three cylinder units has a cast iron block, puts out 110 hp at 2300 rpm with 80 mm injectors. Four cylinder models in the line are available with either a cast iron or aluminum block. They are rated at 151 hp at 2300 rpm, also with 80 mm injectors. Aluminum models are 400 lb lighter than the iron models. All of the engines are available in either right or left hand rotation.

Fageol Products

This company falls in rather a unique category since its engine may be used either as an inboard or outboard. Three versions of the engine are available—pure outboard, vee drive inboard, or a vertical inboard. The engine is a four stroke, gasoline model of 44 cu in. displacement. Power rating varies from 30 hp for standard models, 35 hp for dual carburetion units, and 45 hp for the supercharged version which will be in production later this year.

Fairbanks, Morse & Co.

Newest engine in this company's line is the Model 45B4-1/2 Diesel. This is a two cylinder unit rated at 32 hp at 1800 rpm. The standard model includes a reverse gear.

Gray Marine

Two new inline engines—a four cylinder Diesel and a six cylinder gasoline—were shown for the first time. The Diesel has a displacement of 277 cu in. and puts out 65 continuous hp at 2000 rpm. It utilizes a fresh water closed type of cooling system, a Gray-designed combustion chamber with a Lanova cell, and can be equipped with a special cold weather starting system. The gasoline model develops 136 hp at 3600 rpm unit with a 244 cu in. displacement. One of its features is a new engine mounting setup. It consists of a self-locking jam nut, rubber insert, and a 1 1/4 in. vertical adjustment. In addition to the vertical movement, it permits some angular and horizontal movement.

Hercules

Two, four, and six cylinder Diesels were added to the Hercules line this year. The two cylinder model has a 4 1/4 by 4 1/2 bore and stroke for a 127.5 cu in. displacement. It is rated at 30 hp at 1800 rpm, and weighs 900 lb without the reduction gear. Both the four and six cylinder models are turbocharged and have a 3 7/8 by 4 in. bore and stroke. The 188 cu in. four turns up 105 hp at 3000 rpm. It weighs 950 lb. The 283 cu in. six is rated at 160 hp at 3000 rpm and weighs 1440 lb. In both cases, the weight given is without the reduction gear.

Palmer Engine

Big, oversquare V-8s are being offered in 225, 250, and 300 hp sizes. These engines utilize International Harvester truck engine blocks with overhead valves. Displacement on the three models runs 401 cu in. for the 225 hp unit, 461 cu in. for the 250 hp engine, and 549 cu in. for the 300 hp job. All of the horsepower ratings are given at 3600 rpm. The valve system includes water cooled valve guides, hydraulic tappets, positive rotators on the bottom of springs, Stellite exhaust valve faces and inserts, sealed intake valve stems, and controlled low pressure valve tip and push-rod lubrication.

Red Wing

Latest engine in this company's line is the 100 hp gasoline unit of 230 cu in. displacement. This six cylinder engine is rated at 3300 rpm. It utilizes a six volt electrical system.

Pettters Ltd.

Single and twin cylinder aircooled Diesels were shown. These four stroke engines are rated at six and 12 hp at 1800 rpm. Displacement is 33.8 cu in. per cylinder with a 3.15 in. bore and a 4.33 in. stroke.

Universal

The 100 hp Aqua-Pak inline six is the latest addition to the Universal Motor line. Rated at 3200 rpm, the engine has a displacement of 230 cu in. and weighs 778 lb. An integral vee drive is used to permit stern installation.

Outboard Motors

Production of outboard motors in 1956 has been estimated at 630,000 units, which is roughly a 35 per cent increase over 1955. This is the highest output on record with only 1947 coming close with 625,000 units.

Evinrude

The company's line this year ranges from 3 to 35 hp and features an automobile-type generator and a slip clutch propeller. The 35 hp models turn up to 4500 rpm for maximum power. Two of the units, the Lark and Big Twin, are electric starting. Manual starting has been made easier by incorporating compression relief chambers in the cylinder head. A bypass valve in the compression relief chamber opens when the

(Turn to page 168, please)

Annual Meeting of

The Society of Plastics Engineers

A NUMBER of interesting papers were presented at the well-attended annual meeting of the Society of Plastics Engineers held in St. Louis Jan. 16-18. Two of the papers have been selected for presentation here in the form of abstracts.

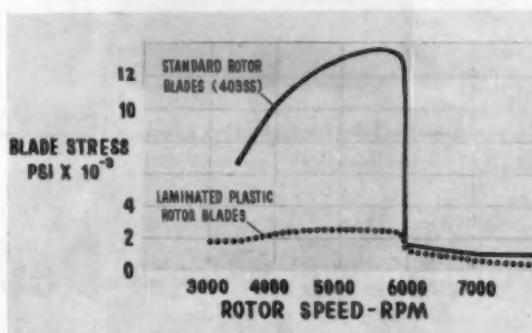
The first of the two papers is by Dale Jackson of E. I. du Pont de Nemours & Co., Inc., and is devoted to the use of synthetic fibers as reinforcing material in formable acrylic sheet plastics. In it he states that the currently available thermoplastic sheet materials for use in vacuum forming offer a wide range of physical properties. In any one material, however, a balance will be struck between impact resistance or toughness, upon one hand, and strength, stiffness, and hardness upon the other.

A polyacrylic plastics sheet (a methyl methacrylate) was prepared in which an acrylic fiber (Orlon) was used as reinforcement, and it was found to have all of the critical physical properties in a high degree. In addition, these acrylic fiber-reinforced acrylic sheets were found to be highly formable by a number of techniques. One method studied was that of vacuum forming, in which the periphery of the sheet was clamped while the warmed sheet was pressed over a mold by atmospheric pressure. Both fiber and plastics were elongated by the process.

The notched Izod impact strength of these sheets increased with increase of fiber content, but the surface roughness after forming increased also, and extent or depth of formability decreased. Both formability and surface smoothness were improved with the use of progressively more complex, higher-pressure methods up to the forming in matched metal molds.

Most of the sheets were made with the acrylic fiber in the form of a needled batt. The use of either a woven fabric or a paper structure resulted in better surfaces after vacuum forming; physical properties were generally independent of reinforcement structure. Dacron polyester fibers and nylon fibers also were used, mostly as needled batts. These fibers offered much higher impact strengths than the Orlon reinforcements, at least at fiber loadings higher than 30 per cent. Formability of the acrylic sheets with either the Dacron or the nylon reinforcement was rather low by the vacuum method, but very satisfactory compound curves were produced in sheets formed in matched metal molds. Strength, stiffness, and hardness of all of the reinforced sheets were equivalent to or better than those of the controls.

The reinforced sheets were made by pouring a peroxide-catalyzed monomer-polymer syrup onto cellophane-covered caul plates, laying on the fiber structure,



Blade stress vs engine speed. Plot shows stress levels in stage 2 for reference blades of 403 stainless steel and the plastic blades.

and curing under pressures of at least 50 psi at temperatures to 100 C.

In his paper, "Plastics Rotor Blades for Turbojet Engines," John F. Kulp, Jr., stated that while the idea of using plastics in jet engines might seem incredible to some people, it is a sound and practical possibility to investigators. The Aircraft Gas Turbine Division of General Electric Co., to which he is attached, recognized the advantages possible if both rotor and stator blades could be made of plastics. Weight savings, lower rim stresses, increased payload, cost reduction, and saving of critical materials are possibilities.

Temperatures encountered in the J-47 engine are about 150 F for compressor inlet temperature, and about 550 F for compressor exit temperature. Use of glass-reinforced plastics blades should provide sufficient thermal stability. Use of CTL-91LD as the best high-temperature resin then available, was decided upon. Three types of glass fabric were used—181 and 112 cloths, both basically orthotropic, and 143 cloth, basically unidirectional. The 181 and 143 cloths were used in the internal layups, and the 112 fabric, a very fine weave, was used for the skin of the airfoil. A small bundle of impregnated rovings was inserted to form the base of the blade.

The layup was then placed in hardened matched steel dies and compression molded at about 200 p.s.i. and 250 to 300 F. After removal the base was trimmed and the tip cut to length. The aluminum dovetail was then fitted onto the blade and bonded with an adhesive.

A J-47-E engine was used for the test. The rotor was built up with plastic blades in stages 2 through 6, with two standard 403 stainless steel blades in stage 2

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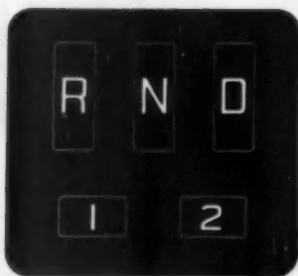


FIG. 1—Pushbutton panel

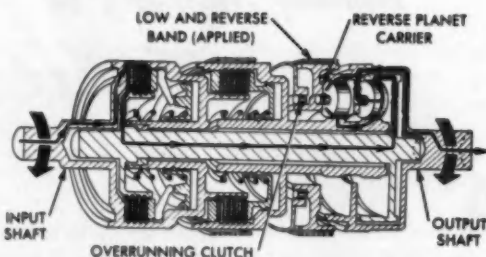


FIG. 2—Power flow (low)

By
S. D. Jeffe and
B. W. Cartwright
CHRYSLER CORP.
Engineering Div.

Design of the TorqueFlite

TORQUEFLITE, Chrysler Corp.'s latest automatic transmission (see AI, Mar. 1, 1956, p. 33), consists of a three-element torque converter coupled to an automatic, three-speed planetary gear box. In addition to neutral, TorqueFlite provides three forward driving ranges and reverse. Gear ratios are obtained through two compounded planetary gear sets and are controlled by two multiple disk clutches, two bands, and an overrunning clutch.

Fig. 1 shows the five push buttons used to select the driving ranges. In the "D" (drive) position, the transmission always starts in "first" gear and automatically upshifts into "second" and "direct." Kick-down into "second" gear is possible below 65 mph, and into "first" below 30 mph. A closed throttle downshift from "direct" to "first" gear occurs at 10 mph.

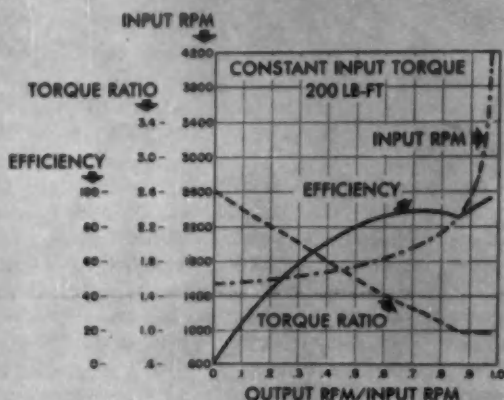


FIG. 3—Performance—11% in 2.6 stall ratio converter

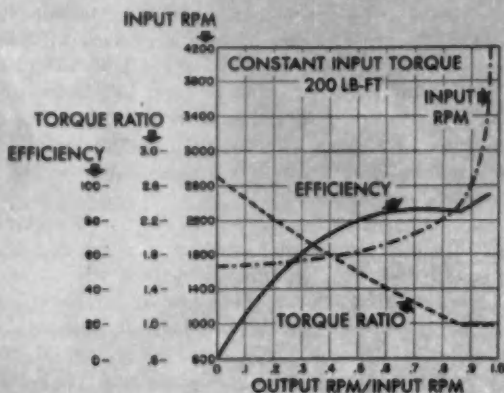


FIG. 4—Performance—11% in 2.7 stall ratio converter

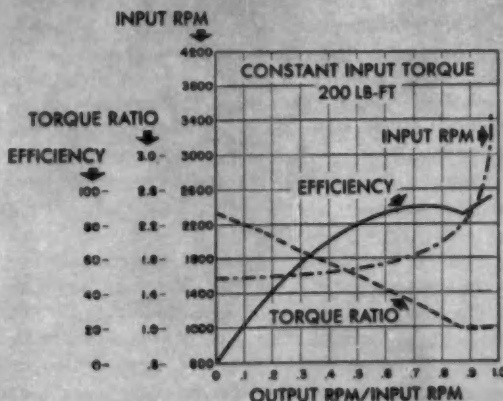


FIG. 5—Performance—12½% in 2.3 stall ratio converter

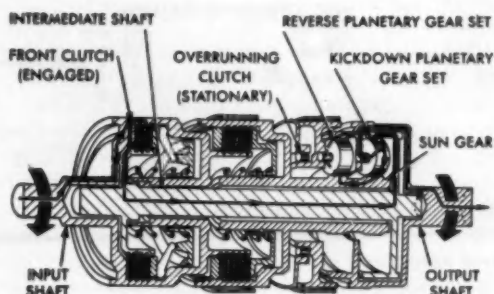


FIG. 6—Power flow (breakaway)

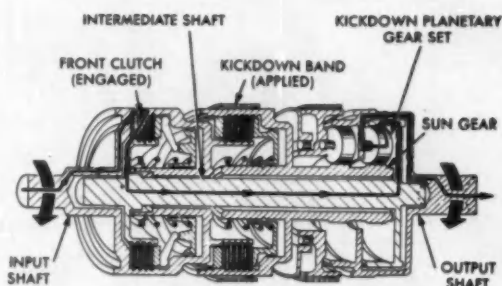


FIG. 7—Power flow (second)

Transmission

In the "2" (second) position, the transmission always starts in "first" gear and automatically upshifts into "second." It remains in "second"—regardless of throttle opening—until 70 mph, and then it upshifts into "direct" to prevent overspeeding the engine. Kickdown into "first" gear is possible below 30 mph. A closed throttle downshift from "second" to "first" occurs at 10 mph. Operation in this gear allows greater drive control in traffic and on hills.

In the "1" (first) position, the transmission starts and remains in low gear regardless of car speed and throttle opening. If this position is selected at speeds above 30 mph and below 65 mph, the transmission downshifts into "second" immediately and remains in "second" until the vehicle speed falls below 30 mph, at which time it downshifts into "first." As is shown in Fig. 2, this is a two-way drive gear position.

Three torque converters are available to cover all Chrysler models using TorqueFlite transmission. All of the converters are single-stage, three element units containing an impeller, a turbine, and a single stator.

An 11¾ in. diam. air-cooled converter, with torque multiplication of 2.6 to 1 at stall speed, is used in the Chrysler Windsor (see Fig. 3). A water-cooled converter with the same diameter and stall torque ratio is used in the Chrysler Saratoga.

An 11¾ in. diam. air-cooled converter, with torque multiplication of 2.7 to 1 at stall speed, is used in all other V-8 installations (see Fig. 4), except the 392 cu in. V-8.

A 12½ in. diam. water-cooled converter, with torque multiplication of 2.3 to 1 at stall speed, is used in all 392 cu in. engine installations (Fig. 5).

Power Flow

In the 1 position, power flow is from the torque converter turbine through the input shaft and front clutch retainer (see Fig. 6). The front clutch is

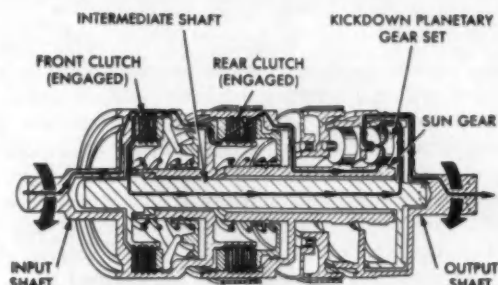


FIG. 8—Power flow (direct)

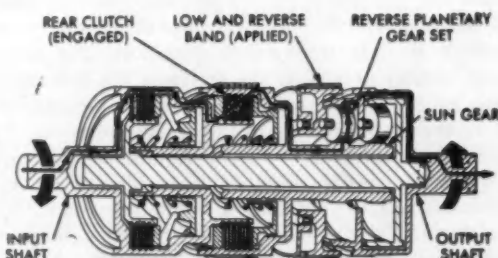


FIG. 9—Power flow (reverse)

engaged and power is transmitted through the front clutch hub and intermediate shaft to the kickdown annulus gear. The annulus gear drives the kickdown planet pinions which rotate the sun gear in a reverse direction. The sun gear rotates the reverse planet pinions forward, resulting in a forward rotation of the reverse annulus. The reverse planet carrier is prevented from rotating backward by an overrunning clutch which becomes stationary during "breakaway." The reverse annulus and kickdown planet carrier combine in the output shaft drive housing to rotate the output shaft forward and produce a torque ratio of 2.45 to 1. For low-range operation (see Fig. 2), the overrunning clutch is locked out by the low band.

In the "2" position (Fig. 7), power flow is from the torque converter turbine through the input shaft and front clutch retainer. The front clutch is engaged and power is transmitted through the front clutch

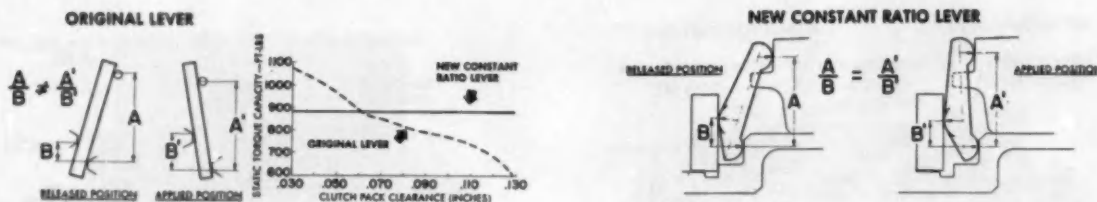


FIG. 10—Front clutch lever operation

hub and intermediate shaft to the kickdown annulus gear. The kickdown band is applied and holds the sun gear stationary. The kickdown annulus gear causes the planet pinions to rotate forward, forcing the planet carrier in the same direction. The kickdown planet carrier is splined to the output shaft drive housing and rotates the output shaft in the same direction, producing a torque ratio of 1.45 to 1.

In direct drive ("D") (Fig. 8), both clutches are engaged and locked together. Since the kickdown annulus gear is connected to the front clutch through the intermediate shaft, and the sun gear is connected to the rear clutch, the kickdown planetary unit is locked—and the entire planetary system rotates as a unit at input shaft speed, producing a 1 to 1 ratio.

In reverse (see Fig. 9), the power flow is from the torque converter turbine through the input shaft and the rear clutch retainer. The rear clutch is engaged and the power flow is through the rear clutch retainer and sun gear. The sun gear drives the reverse planet pinions in the reverse direction. The reverse planet carrier is held by the action of the low and reverse servo and band; and in the planet pinions drive the reserve annulus gear in the reverse direction. The reserve annulus gear, which is splined to the output shaft drive housing, rotates the output shaft in a reverse direction, producing a torque ratio of 2.2 to 1.

Although the upshift sequence of the drive range utilizes all three ratios, the downshift at closed throttle is made to low gear without passing through the second ratio. During the downshift, the transmission remains in direct drive until approximately 10 mph. This arrangement results in an imperceptible downshift, because the overrunning clutch free wheels, completely eliminating bumps or noise. The direct-to-low downshift is done by the 3-1 relay valve, which coordinates movements of both shift valves.

Another feature of the transmission is the provision of an early shift pattern for normal driving and a so-called "delayed" shift pattern for conditions that call for optimum performance. The delayed shift pattern is obtained by depressing the accelerator pedal through the detent to the wide-open throttle position. At wide-open throttle, the 1-2 shift occurs at about 40 mph, and the 2-3 shift at about 70 mph. At the detent, just short of wide-open throttle, the two shifts occur at about 25 and 55 mph.

Design Features

The TorqueFlite transmission incorporates a num-

ber of design innovations in such components as the gear train, front clutch levers, torque converter reaction shaft, planet pinion carriers, overrunning clutch, and rear pump gear.

Both sets of gears in the gear train, for example, have the same number of teeth and identical gear data. The annulus gears have 66 teeth; the planet pinions, 18; the sun gear, 30. Gear teeth are 14 diametral pitch, with a 20 deg. helix angle and a 20 deg normal pressure angle.

Since both sets are the same, the planet pinions, carriers, and planet pinion shafts and needles are interchangeable. The sun gears are both hobbled on a single forging. The annulus gears are made from steel tubing, broached to produce the tooth form.

The initial design of the operating levers in the front clutch assembly has been refined to incorporate four levers instead of eight with a shape that provides a constant lever ratio, regardless of piston travel (see Fig. 10). Since the lever ratio remains constant, the number of friction disks required has been reduced from the original five to four. The levers are made from powdered metal and require no machining.

The torque converter reaction shaft is made from an aluminum impact extrusion. This method of fabrication has eliminated all semi-finishing operations, resulting in only five operations for a finished part. This shaft has been subjected to large torque overload with excellent results.

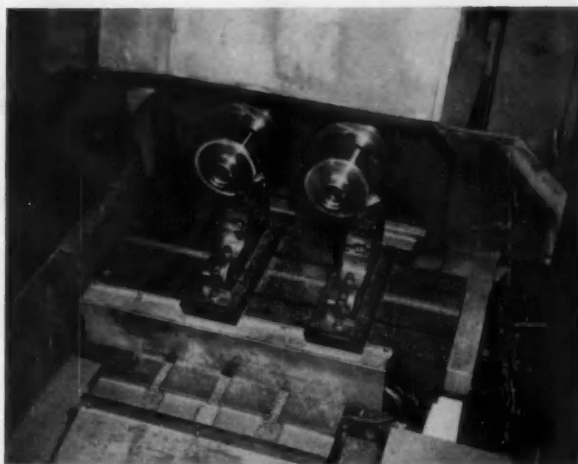
The planet carriers are identical aluminum die castings, which have been designed with sufficient strength to carry the torque load. Only six machining operations are required to finish the part. The kickdown carrier is mounted in the output shaft drive housing. Although it carries the full transmission output shaft torque, the housing is finish-machined from an aluminum die casting.

The overrunning clutch assembly is of the cam and roller type. The unit contains 10 rollers, each with its own energizing spring. The outer race is broached to form the cam surfaces and then finish ground after hardening.

The rear pump outer gear is made of plastic and it operates in an aluminum die-cast pump housing. The gear is accurately molded to size—the only finishing operation is to grind it to the desired thickness. The plastic is capable of withstanding the effect of type A oil at elevated temperatures, without excessive growth or wear.

To keep ahead of future advances in metal cutting, the Manufacturing Engineering Office of Ford Motor Co. has been experimenting with ceramic tools for the past two years. Working with personnel of the various manufacturing Divisions, it has initiated a variety of experimental projects and is expanding the program as further experience is gained and as improvements are effected in the quality of ceramic tools.

At the present writing two major applications have attained the status of regular mass production. First of these was the finish-turning of the OD and facing the sliding gear of a standard transmission, details of which were released several months ago. The latest production setup, considered to be even more impressive from the standpoint of overall performance and economy, is the turning of the OD of an automatic transmission front brake drum at the Livonia plant



Looking down on the table of one of the New Britain, two-spindle precision boring machines used at Livonia for semi-finish-turning the OD of the front brake drum mentioned in the text.

BY
JOSEPH GESCHELIN

Ceramic Tooling at Ford Permits Higher Output per Machine

which produces the Merc-O-Matic and Linc-O-Matic.

The Livonia application has to do with the semi-finish-turning of the 5.90-in. diameter of the front brake drum. The part is made of SAE 111 cast iron composition with Brinell hardness ranging from 163 to 203. The operation is performed in a New Britain two-spindle precision-boring machine, as illustrated.

The cutting tool selected for this operation is a triangular ceramic insert of throw-away type having six cutting edges.

Since the same part has been produced on the same machine for a long time, using a suitable grade of cemented-carbide, the application lends itself to a direct comparison of both types of tooling. This may be summarized as follows:

	Cemented-Carbide	Ceramic
Surface speed/min.	495	1350
Feed in./rev.	0.0058	0.0064
Machining time (min.)	1.17	0.48
Floor-to-floor time (min.)	1.56	0.78
No. pieces/tool index	60	200
Tool cost/piece	0.00345	0.00172
No. machines required	3	2

Let us consider the significance of these data. In the first place, surface speed has been increased by 173 per cent over the former rate. Floor-to-floor time, the best measure of productivity from the standpoint of overall cost economy has been reduced by 50 per cent.

Consider tool life. The cemented-carbide tool averaged 60 pieces per tool index compared with 200 pieces

for ceramic. Consequently, the ceramic tool shows a life expectancy of $3\frac{1}{3}$ times that of cemented-carbide.

Although the ceramic tool costs considerably more than the comparable cemented carbide, the analysis shows that on the basis of overall performance, tool cost per piece is reduced by 50 per cent with ceramic tools.

Productivity and tool cost are not the whole story. Since each cutting edge of the ceramic insert lasts approximately 3.34 times that of cemented-carbide, machine down time for tool setting is reduced correspondingly. And finally higher productivity has made it possible to handle the volume of product with two machines, instead of three, thus releasing one machine as well as its productive floor space for other use.

An interesting sidelight is that the semi-finish operation, typical of ceramic tool behavior, produces an extremely fine and lustrous surface finish which, in this case, is not desirable since the surface must be rough to operate satisfactorily with a brake band. Consequently, cemented-carbide tools will be continued for finishing. On many other parts, the lustrous surface finish would be an asset.

It may be of interest at this point to review the

(Turn to page 124, please)



LeTourneau Transporter, a huge hauler that can haul loads up to 35 tons

Many Advances in Equipment at

1957 Road Show

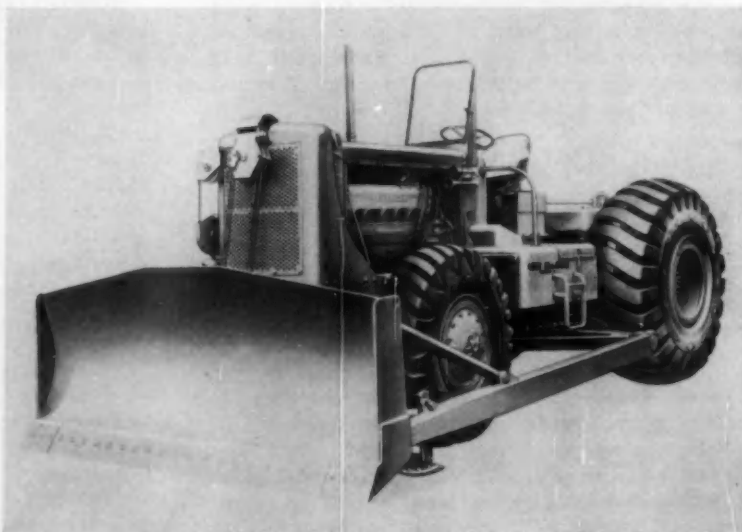
WHAT was undoubtedly the greatest road show was attended by the largest crowd in the history of the event when about 67,000 persons jammed into Chicago's International Amphitheatre Jan. 28-Feb. 2 to see the display of construction machinery. Equipment worth more than \$12 million was shown, much of it for the first time at this show. In addition, approximately \$9 million was spent to put it on display.

Visitors and exhibitors agreed that the show was worth all that it cost. Contractors and their key personnel, top Government officials, financiers, officers in the Armed Services, and road officials at federal, state, and county levels, along with visitors from about 60 foreign countries were given an opportunity to see the industry's road-building muscles. Nearly 300 exhibitors put on display tractors, cranes, motor scrapers, portable mixing plants, shovels, and all the other machinery for earth moving. While many of the machines were large, there was a range of sizes in most types. Emphasis was definitely upon high-capacity, high-powered equipment, in line with the size of the work projects the industry faces.

The show was officially opened by Bertram D. Tallamy, who has just been confirmed by Congress as Federal Highway Administrator. In his talk, he called for new concepts in highway planning and building to put the tremendous highway program into operation. "This is a big job,"

he said. "We must throw into the ash can the 'business as usual' principle."

In connection with the show, technical sessions of the 55th Annual Convention of the American Road



Caterpillar No. 668 (Series C) tractor, latest addition to the company's line of wheel tractors

By Kenneth Rose



White Model 9064 six-wheel, tandem axle construction truck designed to take any one of a number of different bodies

Builders' Association were held at the Congress Hotel. Prominent government officials spoke, including: Sen. Dennis Chavez, New Mexico, chairman of the Senate Committee on Public Works; Sen. Francis Case, South Dakota, of the Senate Subcommittee on Roads; Cong. George H. Fallon, Maryland, chairman of the Roads Subcommittee of the House Committee on Public Works, and a number of Federal Road officials. Papers presented at the sessions dealt with the technical, financial, and legal aspects of the industry.

The Associated Equipment Distributors held their meetings at the Conrad Hilton, and about 125 manufacturers of roadbuilding equipment and accessories placed their displays in the Exhibition Hall of the hotel and in an adjoining parking lot. Fred Salditt, vice-president of Harnischfeger Corp., told the group that about one billion dollars in construction equipment, in addition to the normal market, will have to be financed during the first five years of the highway program.

During the latter part of the week the National Bituminous Concrete Association, 400 strong, moved into the Conrad Hilton for its annual meeting. The International Road Federation, bringing several thousand foreign visitors to the show, held its sessions at the Drake Hotel.

The business sessions of A.R.B.A. saw Julien R. Steelman, president of Koehring Co., Milwaukee, elected president of the association to succeed J. N. Robertson. J. E. McCracken, Bethlehem Steel Co.,



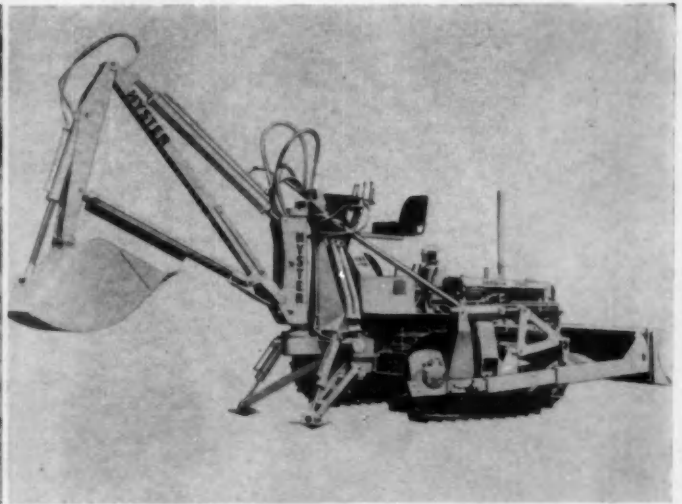
New Autocar 25-ton dump truck with planetary gear drive rear axle

became Eastern Area vice-president; Nello L. Teer, Jr., Nello L. Teer Co., was named Southern Area vice-president; Harold L. Plummer, chairman, Wisconsin State Highway Commission, Central Area vice-president; W. A. Bugge, director, Washington State Highway Department, Western Area vice-president; and Jennings Randolph, Capital Airlines, treasurer.

Clarence E. Killebrew, vice-president of Clark Equipment Co., Benton Harbor, Mich., was chosen president



Thor Power Tool Company's new rig, the Drillcat



Hyster hydraulic D4 backhoe designed for Caterpillar D4 tractor

of the Construction Industry Manufacturers Association. The retiring president, Kenneth Lindsay, executive vice-president of Iowa Mfg. Co., called for a road show every four years as a necessity to keep pace with the development of equipment in the industry. Boyd S. Oberlink, vice-president of the Tractor Group of Allis-Chalmers Mfg. Co., was chosen first vice-president of CIMA. Henry Barnhart, vice-president and general manager, Construction Equipment Div., Baldwin-Lima-Hamilton Corp., became second vice-president of the association, and P. H. Brickhead, vice-president, Bucyrus-Erie Co., treasurer.

L. Miner Doolen, Telford Equipment Co., Lansing, Mich., will head the Associated Equipment Distributors for the coming year, succeeding Stanley Lasky. H. D. Anderson, Rish Equipment Co., was named executive vice-president, with F. J. Fitzpatrick, Parker-Danner Co., and Jewel A. Benson, Benson Tractor Co., as vice-presidents; H. T. MacDonald, Kane Equipment, Ltd., Canadian vice-president, and John R. Borchert, Borchert-Ingersoll, Inc., treasurer.

Manufacturers seemed agreed that orders for new equipment for the highway program have not as yet been placed in quantity. Contractors are waiting to see what jobs are awarded them. This throws upon the equipment manufacturer the necessity to build up his inventory so that the orders, when placed, can be filled rapidly. Some of the equipment on display was purchased at the show, however.

One of the features of the equipment at the Road Show to strike the visitor first was the use of color. The equipment shown was of every color of the rainbow. No longer is construction equipment to be exclusively red, black, or green. The second feature that would impress the visitor upon even casual viewing was the size of much of the equipment.

Still another outstanding trend was the increasing use of Diesels in equipment of medium and small size. While these engines have predominated in the larger roadbuilding machines for some time, their extensive

employment in the smaller equipment is a comparatively recent development.

Harnischfeger introduced a new high-mobility Handyman Wagon Crane, of 10-ton capacity, with extra-short turning radius, traveling at better than 10 mph. A 67 hp Diesel powers carrier and upper.

Massey-Harris-Ferguson introduced a line of five versatile wheel tractors, its Work Bull line, for use as primary equipment or back-up or clean-up tools.

International Harvester, with a large display, introduced new higher capacity equipment in its "95" Paywagon, Payscraper, Payloader, and Payhauler. heavy equipment, but can be used for land clearing.

R. G. LeTourneau, Inc., announced a new off-highway vehicle that can haul 35-ton loads across rough country. It is intended primarily for transporting heavy equipment, but can be used for land clearing.

Caterpillar Tractor Co., with a large exhibit, announced new pieces of equipment, including an interchangeable scraper hitch, a new side dumping bucket for its Traxcavators, a combination dozer and ripper blade, a high speed, 300 hp 4-wheel drive tractor, a U-dozer blade for its heavy tractors, and several new Diesel engines for powering generators, portable equipment, pumps, etc.

Cummins announced three new models of Diesel engines, including an 8-cyl 375 hp turbocharged model, a 4-cyl 60 hp unit, and a 375 hp Turbodiesel.

The largest engine in the show was an 800-hp Diesel of White Motor Co., which also displayed several new off-highway dump trucks, of 15- to 25-ton capacity, by its Autocar Division.

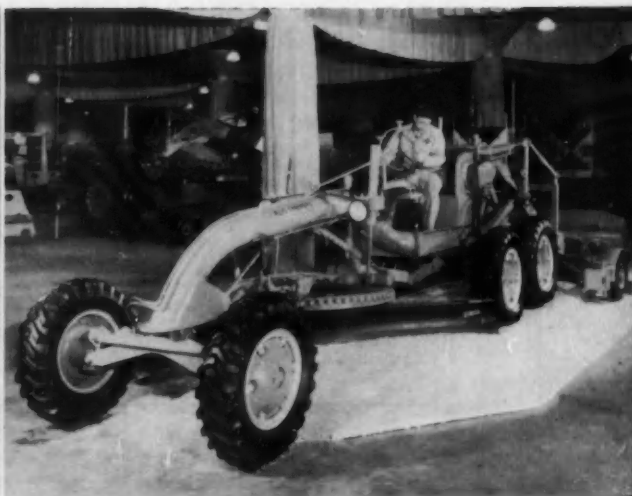
Mack Trucks, Inc., displayed several of its newer models of off-highway trucks, including a 6-wheeled, 24-cu yd monster with a 400 hp engine.

Timken Roller Bearing Co. announced that 89 per cent of the machinery manufacturers exhibiting at the Road Show used Timken bearings.

Clark Equipment Co. displayed seven new machines in its construction equipment line, including rubber-



Elanco 105 front end loader which can discharge a cargo of 15,000 lb over a 14-ft bin



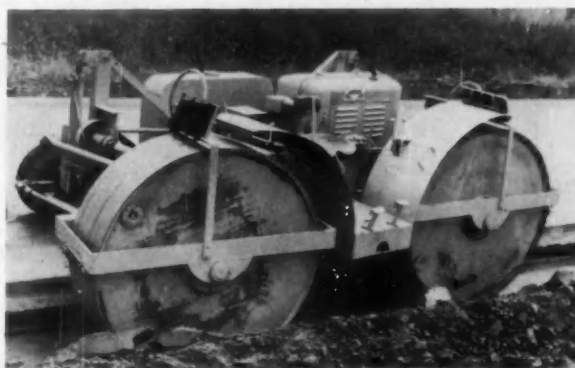
Allis-Chalmers motor grader

tired tractor scrapers as well as tractor dozers.

Allison Division of General Motors showed a cut-away model of its new Highway Torqmatic transmission in a display of many power-transmitting mechanisms. Thor Power Tool Co. announced a new rock drilling crawler, along with a new electric generator, a motor-in-head vibrator, and a sound-deadener for the air hammer.

A line of small, lightweight cranes quickly convertible to dragline, clamshell, shovel, backhoe, pile-driver, etc., developed recently by Schield-Bantam Co., is

(Turn to page 111, please)



Photograph above shows the Blaw-Knox Model DTR-552 dual drum trench roller

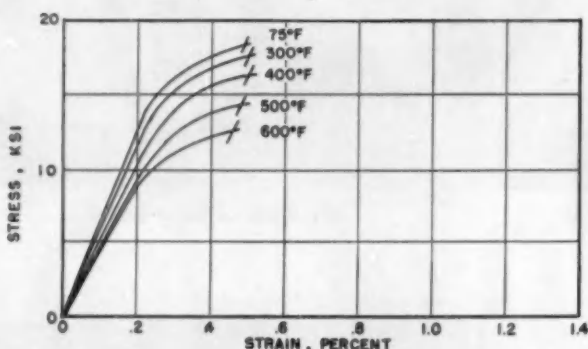


Shown at left is the LeTourneau - Westinghouse Model D Tourn tractor, a medium size 143-hp unit

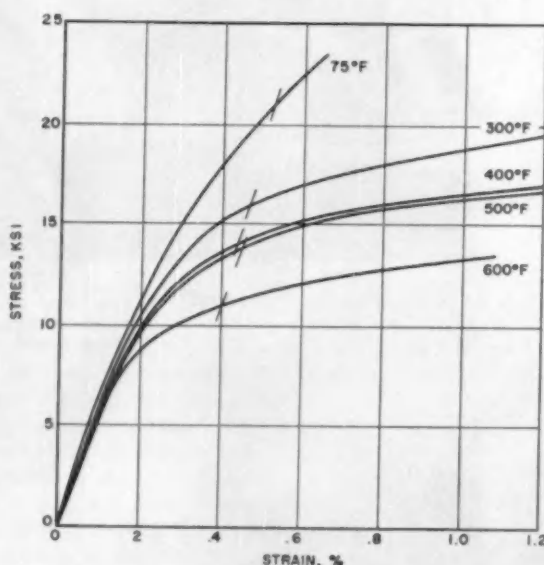
High Temperature Magnesium

for

SUPERSONIC AIRCRAFT



Compression stress-strain curves of HM21XA-T8 sheet—longitudinal



Tension stress-strain curves of HK31XA-T6 sheet—longitudinal

HM21XA-T8 ALLOY COMPOSITION

	Percent
Thorium	1.5 - 2.5
Manganese	0.35 - 0.8
Other impurities, each, max.	0.1
Other impurities, total, max.	0.3

MAGNESIUM-THORIUM alloys seem to be the current answer to light-weight, high-temperature requirements for supersonic structural airframe components. Several alloys have been proposed, but it was only in the last few months that an Mg-Th alloy—HK31A—was released in production quantities. Now another promising magnesium-thorium alloy—HM21XA-T8—is available for evaluation at high temperatures.

These two alloys now form the nucleus of the testing and production programs being carried out on high temperature magnesium in the aircraft industry. Evaluation of the alloys is under the sponsorship of the Materials Laboratory, Wright Air Development Center. There are also about a dozen aircraft companies currently using the HK31A alloy in an evaluation program. Three companies are scheduling production quantities of the alloy.

Because thorium is a radioactive element, Dow Chemical, producer of the new alloys, has thoroughly investigated its toxicity in Mg-Th alloys. A standard of 0.1 mg per cu m of thorium in air is a safe limit for continuous atmospheric exposure and is readily met in processing magnesium alloys containing as much as 10 per cent thorium. Only long exposure to fine dust or fumes need cause concern. Normal dust control precautions, followed to avoid fire hazards, can be expected to control any health hazards that might result from fine dust in grinding the alloys. Exhaust ventilation is also recommended for welding operations.

For indoor storage of sheet and plate, the size of stacks of sheets should be limited to 1000 cu ft. Aisle widths should be not less than one-half the height of

stacks, but aisle widths equal to the height of stacks are recommended. This is identical to good fire-prevention practice for conventional magnesium alloys.

HK31A ALLOY

The chief alloying constituent of HK31A, in addition to 2.5-4.0 per cent thorium, is 0.5-1.0 per cent zirconium. Properties of the magnesium alloy give a wide range of service, even for temperatures as high as 800 F for short periods of time. The material is available in sheet and plate in the half-hard temper (-H24), and in the fully annealed temper (-O). At elevated temperatures, the alloy maintains a high ratio of fatigue strength to static strength. This ratio at elevated temperature is comparable to other magnesium base alloys at room temperature.

No differences have been found in machinability of HK type alloys versus conventional magnesium alloys.

Laboratory studies of the deep drawability of HK31A-H24 sheet shows maximum reduction in area is attained at 650 F to 700 F. There is no lowering of mechanical properties due to exposure if time at maximum drawing temperature is held to short periods, such as 10 min. The maximum reduction of area is 67 per cent and is comparable to that of AZ31BO alloy.

HK31A has been drawn in both the -O and -H24 tempers on production equipment normally used for other commercial magnesium alloys. Reductions of 40 per cent to 60 per cent at drawing speeds of 6 to 10 ipm have been successfully used. The average die temperature for -O temper material is about 600 F while for -H24 temper it is about 700 F. Punch temperatures for -O temper range between 450 and 500 F; for -H24 temper, 550 to 600 F. If parts are formed at too low a temperature, cold cracking failures will result. In general, HK31A possesses good forming and drawing characteristics if slightly higher temperatures than for AZ31B are used.

Alloy and Temper	Temp of Test F	Bend Radius
HK31A-H24	70	8.t
	600	4.t
	650	3.t
	700	2.t
HK31A-T6	70	6.t
HK31A-O	70	5.t
	600	3.t
	650	2.t
	700	1.t

t.—Sheet Thickness

One of the outstanding characteristics of HK31A alloy is its good weldability. Due to its freedom from cracking, it can be readily arc or spot welded. In general, it should not be necessary to preheat sheet, plate, extrusions or castings prior to welding. HK31A alloy is also weldable by the gas method, but difficulty has been experienced in depositing the weld metal due to poor fluxing action.

Arc weld efficiencies of 85 per cent are obtained with HK31A-H24 sheet at room temperature. Strengths range from 31,000 to 34,000 psi, bead intact. Approximately 1000 psi lower values are obtained with weld beads ground flush.

At elevated temperature, weld strengths are not significantly different from unwelded sheet. For instance, at 400 F weld efficiencies are 100 per cent.

Post weld aging treatments, at various temperatures, increase room temperature properties up to 10 per cent. Best aging temperatures are 500 F for four hours, or at 400 F for 16 hr.

When arc welding HK31A to itself, or to magnesium base alloys not containing aluminum, HK31A welding rod should be used. When HK31A is welded to any of the Mg-Al-Zn alloys, AZ92A welding rod should be used. Weld strengths in the vicinity of 28,000 psi are obtained with HK31A castings welded to HK31A sheet.

Stress relieving is considered unnecessary from the standpoint of stress corrosion. If a stress free struc-

100 HOUR CREEP DATA OF
HM21XA-T8—UP TO 0.125 In. THICKNESS

Test Temperature (F)	Stresses in 1000 psi		
	.1% Creep Extension	.2% Total Extension	.5% Total Extension
300	14.9	11.5	15.6
400	13.3	10.5	13.5
500	8.0	7.0	9.0
600	5.0	5.0	6.0
700	2.3	2.6	3.5

ELEVATED TEMPERATURE PROPERTIES OF
HM21XA-T8 100 HOUR EXPOSURES
(UP TO 0.125 In. THICKNESS)

Test Temperature (F)	Longitudinal Properties			
	%E	Values in 1000 psi		
		TYS	CYS	TS
80	10	25	15	34
400	30	17	15	13
500	25	15	15	16
600	15	12	12	14
700	50	8	8	11
800	100	3	3	5
900	>100	1	1	2

ture is desired, stress relief can be effected by heating at 650 F for one hour.

Spot welding can be performed on equipment and with cleaning methods presently used for magnesium

Settings and properties closely approach those for AZ31B sheet alloy, current requirements being slightly higher for HK31A alloy.

Corrosion rates of welds with HK31A rod are about equal to unwelded sheet, hence welding has no significant effect on corrosion rate.

HK31A responds to both dip and anodic type chemical treatments in much the same manner as other non-aluminum bearing alloys, such as the magnesium-manganese alloy M1A.

HM21XA-T8 ALLOY

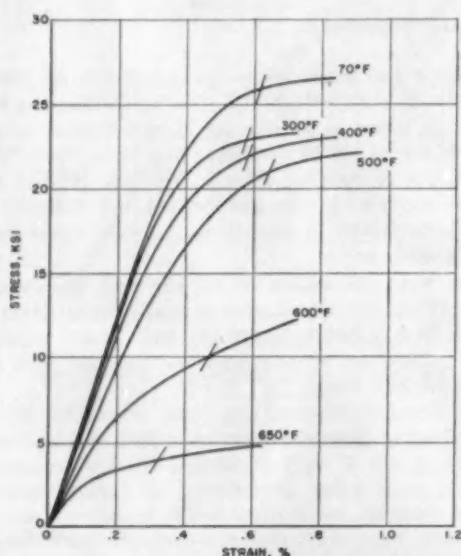
Distinctive features of HM21XA-T8 as compared to the HK31A alloy currently available are as follows:

HM21XA-T8 has properties equal to or better than the HK31A composition heat treated to the -T6 temper. The material is available in the -T8 temper and does not require heat treatment by the user as is the case with HK31A-T6.

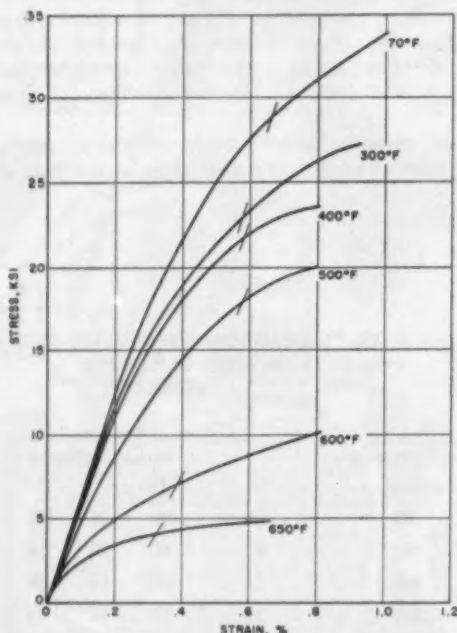
The alloy has exceptionally good stability at elevated temperatures. One-hundred-hour exposures at temperatures as high as 700 F cause virtually no change in room temperature properties. Elevated temperature properties are not reduced by exposures up to 100 hr at the test temperature.

HM21XA-T8 has superior creep strength over HK31A-T6.

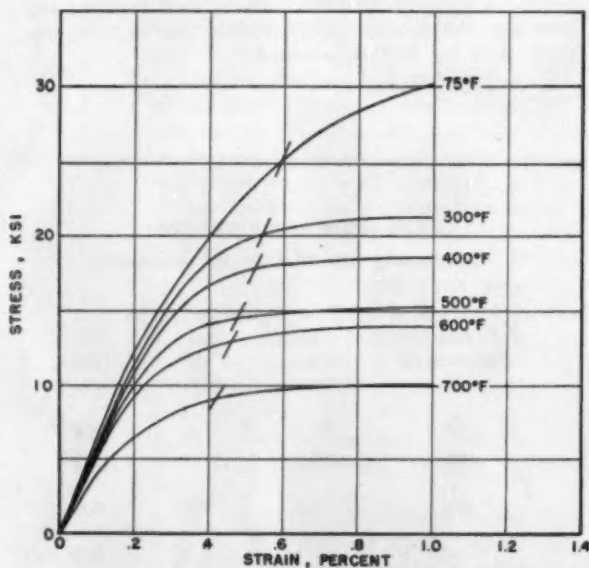
Properties given in the accompanying table are in the longitudinal direction. Limited testing in the transverse direction indicates comparable properties in all cases except for room temperature tensile yield strength. Tensile yield strength in the transverse direction at room temperature appears to be approximately 4000 psi below the longitudinal value. At ele-



Compression stress-strain curves of HK31A-H24 sheet—longitudinal



Tension stress-strain curves of HK31A-H24 sheet—longitudinal



Tension stress-strain curves of HM21XA-T8 sheet—longitudinal

PROPERTIES OF HK31A SHEET —TENTATIVE TYPICAL VALUES—

(0.040 in. to 0.250 in.)

Temper	Temp. of Test F	%E	TYS	1000 psi CYS	TS	1000 psi Punch Shear*	1000 psi Single Shear**	Elastic Modulus psi x 10 ⁶	Hardness RE
H24	70	8	29	25	37	21	27	6.4	66-71
	400	21	21	22	24	14	14	5.7	
	500	19	17	20	20	11	12	5.2	
	600	70	7	10	13	7	9.5	4.1	
	800	—	—	—	—	—	—	—	
T8	70	14	21	18	37	21	—	6.3	59-69
	400	19	15	14	23	13	—	5.7	
	500	22	12	12	18	10	—	5.2	
	600	—	—	—	—	—	—	—	
	800	—	—	—	—	—	—	—	
O	70	23	21	15	33	21	23	6.4	48-61
	400	50	13	—	15	10	12	6.0	
	500	60	7	—	10	6	8	4.3	
	600	—	—	—	—	—	—	—	
	800	—	—	—	—	—	—	—	

* Punch Shear: Calculated from room and elevated temperature tensile and room temperature shear data.

** Single Shear: Data, average of longitudinal and long transverse directions as no appreciable difference was found. As short transverse direction is approached (punch shear) there is a decrease in shear strength.

PROPERTIES OF HK31A PLATE —TENTATIVE TYPICAL VALUES—

(0.250 in. and up)

Temper	Temp. of Test F	%E	TYS	1000 psi CYS	TS	1000 psi Double Shear*	1000 psi Single Shear**
H24	70	15	23	22	31	20	22
	300	16	21	20	23	15	16
	400	16	18	20	20	13	13
	500	15	15	17	18	12	11
	600	36	7	10	14	9	8
T8	70	13	18	14	37	20	—
	300	20	16	14	28	15	—
	400	21	15	14	26	14	—
	500	16	14	13	21	11	—
	600	17	12	12	18	10	—
800	650	22	19	11	17	9	—

* Calculated from room and elevated temperature tensile and room temperature shear data.

** Calculated from room and elevated temperature tensile and single shear data, and is representative of average of longitudinal and long transverse shear directions.

vated temperatures this difference becomes negligible. The bend radii on 0.064 in. sheet at different temperatures are given in the listing at the right.

Temp. F	Bend Radius in Sheet Thickness (t)
70	5.5-6.0
300	5.0-6.0
400	4.5-6.0
500	5.5
600	3.5-4.0
700	2.5-3.0
800	1.2

Effect of Elevated Temperature Exposure on The Properties of HK31A Sheet—0.040 in. to 0.250 in.

Exposure F	Hours	Temp. of Test F	%E	TYS	1000 psi CYS	TS
300	0	70	8	29	25	37
	5000	70	8	29	25	37
	—	—	—	—	—	—
500	0	70	11	29	24	37
	5000	70	16	29	21	36
	—	—	—	—	—	—
600	30 min.	70	9	29	25	37
	1000	70	21	25	18	38
	5000	70	20	23	18	34
700	5 min.	70	8	29	24	36
	60 min.	70	18	29	21	35
	—	—	—	—	—	—
300	0	300	20	23	23	26
	5000	300	20	23	23	26
	—	—	—	—	—	—
650	0	400	29	20	22	22
	60 min.	600	96	6	10	11
	—	—	—	—	—	—
700	15 min.	400	31	21	22	22
	15 min.	600	70	7	10	12
	—	—	—	—	—	—
300	0	70	14	21	15	37
	5000	70	14	21	15	37
	—	—	—	—	—	—
600	0	70	14	21	15	37
	5000	70	10	14	10	31
	—	—	—	—	—	—
600	0	70	14	21	15	37
	100	70	12	16	11	32
	5000	70	5	14	10	29
700	0	70	14	21	15	37
	2	70	14	16	9	29
	—	—	—	—	—	—
400	0	400	18	15	—	23
	—	—	—	—	—	—
	—	—	—	—	—	—
600	1	400	21	15	—	23
	8	400	30	11	—	21
	—	—	—	—	—	—
700	1	400	40	9	—	15
	2	400	43	7	—	13
	—	—	—	—	—	—
500	0	500	21	14	13	20
	5000	500	64	8	—	9
	—	—	—	—	—	—
600	0	600	22	12	12	18
	8	600	28	8	—	14
	5000	600	51	4	—	8
650	1	600	15	10	—	17
	4	600	38	5	—	10
	—	—	—	—	—	—
700	1	600	30	8	—	11
	2	600	34	8	—	10
	—	—	—	—	—	—
650	0	650	30	8	11	13
	5000	650	90	3	—	8
	—	—	—	—	—	—

No significant change in bend radius from room temperature up to 500 F occur. Parts requiring smaller than room temperature bends will therefore have to be bent at 600 to 800 F. Preheating the parts to 700 F and the bending dies to 400 F result in bends of 3.5t or equivalent to those obtained at 600 F.

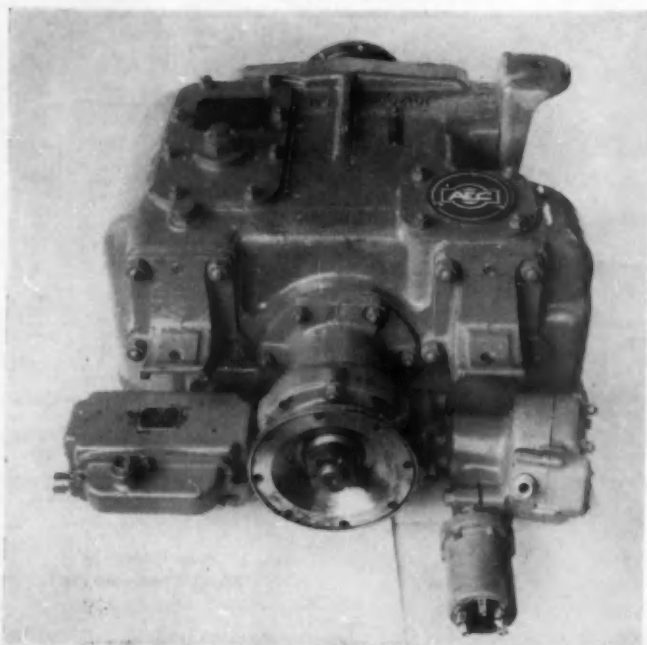
HM21XA material requires die temperatures of 700-750 F and punch temperatures of 350-450 F. Drawing speeds up to 12 ipm are satisfactory. Radii on drawing dies should be generous to approach the values previously given. Limited experience on production draws indicate that the material can be drawn satisfactorily on certain draws but the limiting condition in terms of per cent of reduction have not yet been established.

Room temperature properties are not significantly affected by exposure conditions. The material can be heated to the following conditions without loss of properties at 600 F: 700 F for 30 min; 750 F for 30 min; and 800 F for 10 min.

Preliminary arc welding tests indicate that the alloy is very weldable with practically no tendency to weld cracking. Indications are that 100 per cent efficiency at elevated temperatures (500-700F) is obtainable after welding. The best welding rod composition has not yet been established, but HM31XA appears to offer the most promise.

HM21XA can be readily spot welded. Shear strengths obtainable on 0.064 in. sheet welds together with typical data for AZ31B-O (Mg-Al-Zn) and HK31A-H24 are given below:

Material	Spot Diam. (in.)	Shear Strengths (Lb)	Electrode Force (Lb)
AZ31B-O	0.25-0.30	680-850	1600-2400
HK31A-H24	0.25-0.30	650-850	1600-2400
HM21XA-T8	0.25-0.30	600-770	1600-2400



Wilson-type epicyclic gearbox with electro-pneumatic valve unit and alternator mounted on the rear of housing. Driven by the output shaft, the generator delivers a voltage proportionate to road speed.

BY
DAVID
SCOTT

BRITISH AUTOMATIC TRANSMISSION

A FULLY automatic transmission system with electro-pneumatic control has been introduced by Associated Commercial Vehicles Ltd. of

England. It is intended primarily for use with the Wilson-type epicyclic gearbox (described in A.I., April, 1954) in conjunction with a fluid flywheel.

A speed sensitive generator mounted on the transmission case and driven from the output shaft delivers an a-c voltage, proportionate to road speed, to the control unit. Three voltage-sensitive relays in the control unit each operate a multi-contact relay that energizes the appropriate gear solenoid, and suitable interlocks prevent the functioning of any other solenoid.

Valve Units

The electro-pneumatic valve unit houses five sets of air valves actuated by individual solenoids. The valves are connected by short pipes to the brake-band-operating cylinders. Valves are in a common gallery supplied with compressed air from the main reservoir.

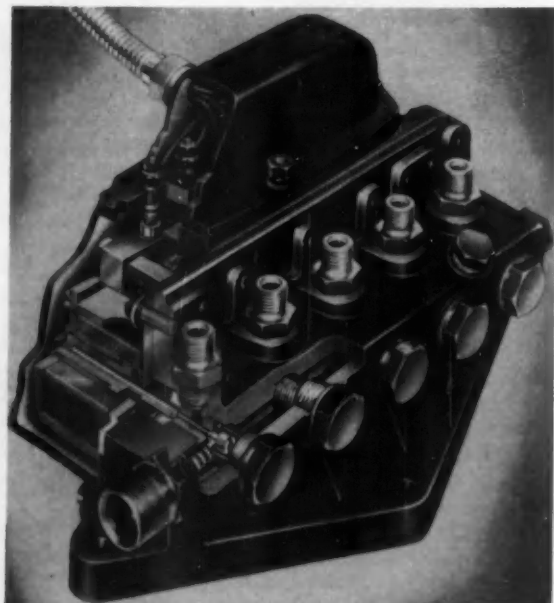
Sensitivity to Torque

Torque-sensitivity is effected by a four-position switch mechanically linked to the throttle pedal. Contacts on the hinged arm close successively as the pedal is one-third, two-third, and fully depressed. The first pair of contacts closes at the start of pedal travel, allowing the vehicle to pick up a gear initially and also to revert to neutral when the engine is idling.

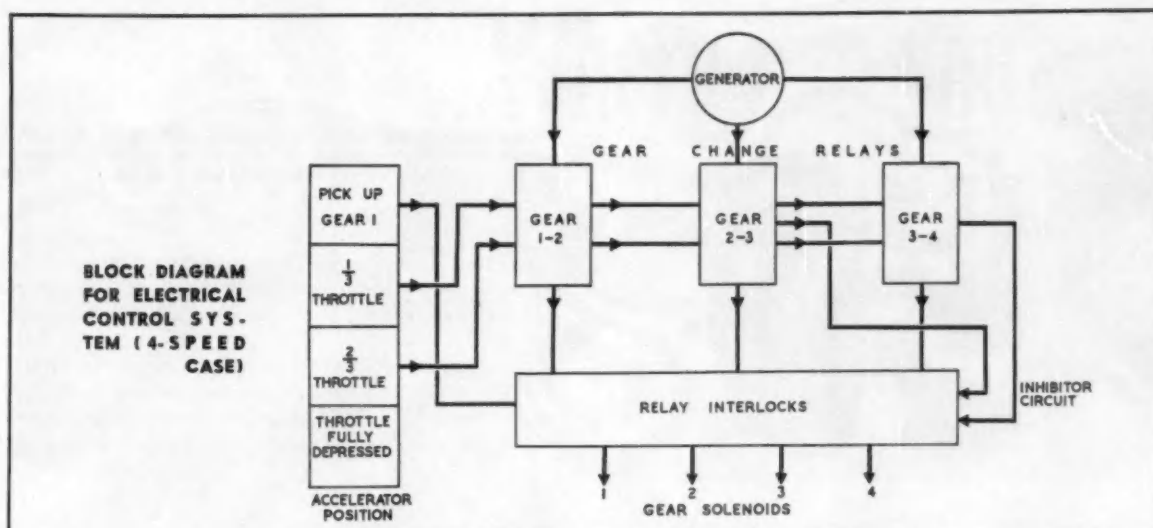
Battery voltage applied by this switch superimposes additional excitation on the appropriate relays through separate windings. Thus gear changes are automatically regulated by engine torque as determined by the position of the accelerator, as well as by road speed.

Shift Selector

A selector box with gated lever (mounted on the steering column) permits selection of automatic, re-



Air valves in the electro-pneumatic unit are operated by solenoids actuated by voltage-sensitive relays. Valves are piped to the gearbox brake-band cylinders; compressed air is supplied from the main reservoir.



Has Electro-Pneumatic Control

verse, and manual gear shifting. The manual position is used to override the control system for engine braking or other reasons. It is wired to the electro-pneumatic valve unit by a multi-core cable.

In automatic, upward gear changes are determined by the sum of the voltages obtained from the generator and accelerator circuits. Under normal conditions, road speed is the dominant element. For rapid acceleration with the throttle fully depressed, changes occur at higher speeds to provide the maximum engine torque in each gear.

Down Shifts

Downward shifts take place at lower road speeds. When the vehicle is coasting with light throttle on level ground, top gear is retained until speed falls to 2-3 mph, after which the transmission drops into neutral. This operation is governed by an inhibitor circuit that cancels the functioning of the intermediate gear-change relays. However, the driver can at any time depress the throttle to engage the gear appropriate to speed and torque requirements automatically.

No Creeping

With the vehicle at rest no signal is generated and neutral is held, eliminating fluid flywheel slip and creeping. First gear is selected when re-starting, but an electric interlock prevents its engagement at wide throttle openings. This eliminates the risk of severe jerking if the engine is raced while the vehicle is stationary.

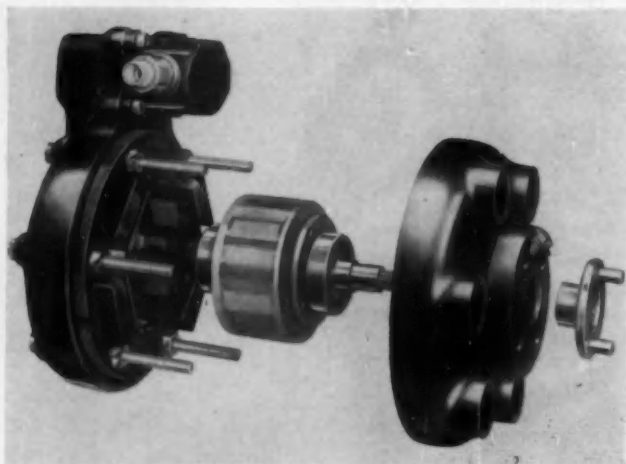
Flexibility

A high degree of flexibility is claimed for the system. Gear-shifting speeds, for example, can be easily

altered to suit a variety of operating conditions simply by changing resistances in the control circuits. It is also possible to shift some of the gears automatically



Accelerator switch for torque-sensitive control of gear selection is mechanically linked to throttle pedal. Contacts on swinging arm apply overriding voltages successively to speed-sensitive circuits as pedal is depressed.



Permanent magnet alternator, geared directly to the output shaft of the transmission, delivers an a-c voltage for speed-sensitive control of gear selection.

Nuclear Age to Bring Changes In Military Vehicle Design

The atomic age is bringing an entirely new concept to design of military vehicles and equipment as well as to military tactics. Army Ordnance now is charged with developing lightweight highly mobile equipment which can be airborne, according to Col. Edward Mohlere, Commander of the Detroit Ordnance District.

He told members of the Michigan Economic Development Commission, meeting at the Detroit Arsenal, that the new concept visualizes dispersal of forces in battle areas in smaller, highly flexible units. This, he said, requires lightweight vehicles — perhaps with aluminum armor — of a

design which permits ease of maintenance.

Depots and repair shops of the type used in World War II and in Korea, he said, will be obsolete under conditions of atomic warfare. As a result, maintenance and repair will be performed by mobile units.

The ratio of vehicles to personnel also will increase. It was one vehicle to seven soldiers in World War II, but the new ratio is expected to be 1 to 4.

High on the development list is a new 2½ ton truck with about the same dimensions as the current model but considerably lighter. It is hoped to reduce weight from 12,000 to about 7500 lb. Under consideration is ad-

and others manually, as in the case of the bottom ratio, which is used only for emergency starting. The equipment is thus adaptable to both 3- and 4-speed gear-boxes.

A.C.V. has conducted extensive tests with this transmission. Units of a similar type will be installed in an initial batch of 850 Routemaster double-decker buses which the company will build for London Transport.

dition of one more driving axle to make a total of four.

A universal chassis for all wheeled vehicles also is under study. The number of axles could be varied and modifications made in other components of the drive train, but the basic chassis would be uniform for all vehicles.

Ordnance officials urge companies having capacity and equipment to produce components for guided missiles and other military items to get in touch with Detroit Ordnance District for information. DOD is actively promoting its contacts with small firms, but recognizes that there are many it does not reach through normal channels.

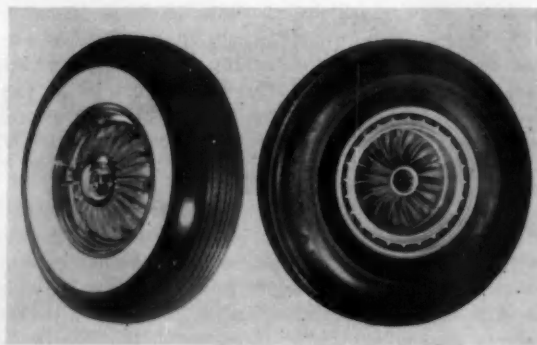
Wheel, Hub and Brake Drum Die Cast as Integral Unit

AN aluminum wheel, to be die cast as an integral unit including hub and brake drum, has been developed by the product development department of Kaiser Aluminum & Chemical Corp.

The prototype wheel, complete with 14-in. diameter steel rim, weighs only 30 lb as compared with 42.6 lb for a steel wheel, hub and brake drum assembly, a weight saving of approximately 30 per cent.

Design of the die-cast wheel eliminates a separate wheel disk and hub casting. These parts are combined with the brake drum to form a strong but lightweight and efficient structure. The rim is the demountable type, held in place with chrome plated rim clamps.

Heat transfer to the rim is minimized by reducing contact between the rim and wheel. As a result, little direct heat is transferred to the tire.



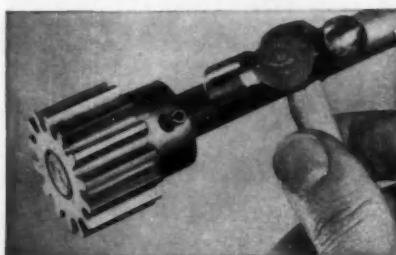
The braking surface of the wheel can be either a metallurgically bonded iron liner, a cast-in iron liner, or a metallurgically bonded metal spray liner.

Where can you use this simple fastener?

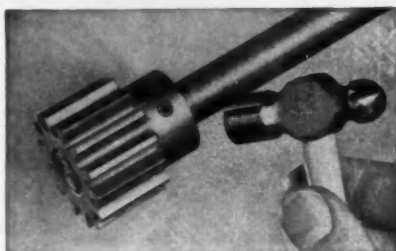


No threading, peening or precision
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Rollpin is driven into holes
drilled to normal production-
line tolerances.



It compresses as driven.



Rollpin fits flush . . . is vibration-proof.

Rollpin is the slotted tubular steel pin with chamfered ends that is
cutting production and maintenance costs in every class of industry.

This modern fastener drives easily into standard holes, com-
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impact loading, stress reversals or severe vibration. Rollpin is
readily removable and can be re-used in the same hole.

* * *

*If you use locating dowels, hinge pins, rivets, set screws—or
straight, knurled, tapered or cotter type pins—Rollpin can cut
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Elastic Stop Nut Corporation of America, Dept. R16-25
2330 Vauxhall Road, Union, New Jersey

Please send me the following free fastening information:

- ☐ Rollpin bulletin ☐ Here is a drawing of our
product. What fastener
☐ Elastic Stop Nut bulletin would you suggest?

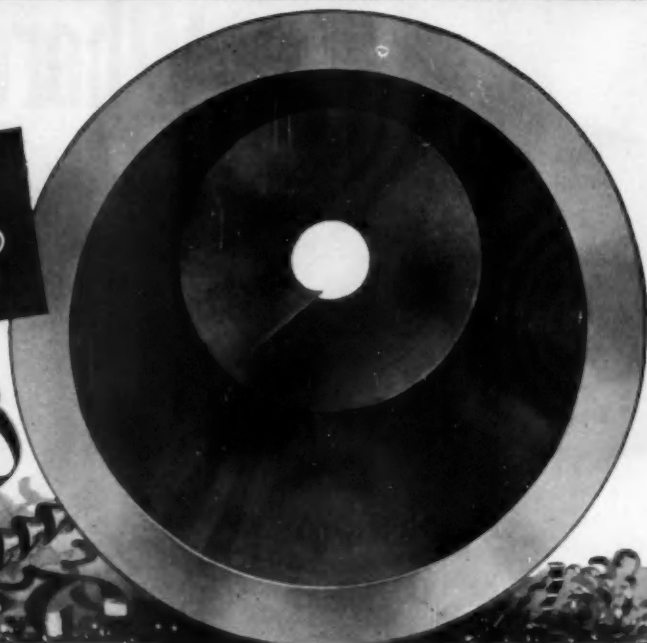
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Write for Guide to the Use of Seamless Mechanical Tubing, Technical Bulletin 340.

The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels



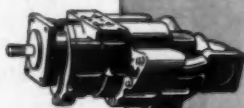
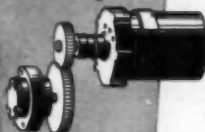
Pesco submerged fuel booster pump . . . removable from top of tank.

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power
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Pesco Cartridge® pump for precise propeller pitch control.



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► The new Lockheed Electra is the first of the planes-of-tomorrow that will introduce a new era of air travel. And naturally enough, the Electras will be equipped with 28 Pesco fuel and hydraulic pumps. As these turboprop-powered airliners cruise along at 7-miles-a-minute, Pesco pumps will be quietly performing vital jobs—transferring fuel from wing tanks to engines . . . providing a pressurized flow of fuel into the 3,750-hp engines . . . regulating the pitch and feathering action of the propellers. Pesco is proud to have been selected as the sole source for these accessories. It is more evidence that *Pesco means progress in pumps*—for aircraft, missiles and industry.

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Is Your Engine "Horsepower-Limited" by Tappet Face Stress?



Flat-Face Self-Aligning Tappets and Hydraulic Valve Lifters

The high cam lifts and heavy valve spring loads involved in developing higher horsepowers place increased stress on cams and tappets. Spherical face tappets make only limited-area contact with the cam, which frequently results in damaging wear or pitting. Flat-face tappets lower the unit stress, but their use has been limited by misalignment and deflection, which cause edge-riding. The Eaton self-aligning flat-face tappet permits full contact between cam and tappet to be maintained under all operating conditions.

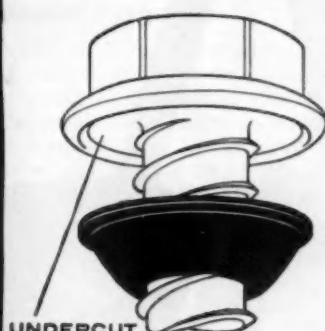
Improve your engine by taking advantage of this new Eaton engineering development which has broken through the stress barrier. Call our engineers for a consultation.

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For better products LEAKPROOF...CUSHIONED TUFF-TITE® FASTENERS



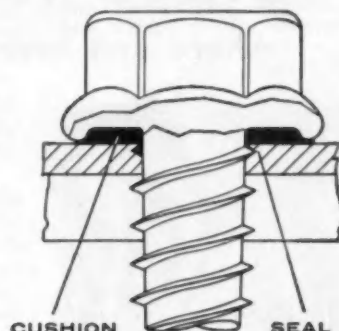
UNDERCUT

Undercut of Tuff-Tite fastener head...



NEOPRENE WASHER

... confines and controls flow of conical neoprene washer



CUSHION

SEAL

... so washer seals the hole and cushions the fastener head!

Now you can • prevent leaks at fastener holes

- protect fine finishes from fastener damage
- stop vibration noises and squeaks

It's the combination of undercut head design and tough, conically shaped neoprene washer that makes Tuff-Tite fasteners work. The undercut helps confine and control spread of the neoprene washer as it is compressed. The washer's conical shape causes it to flow into top threads and seal the fastener hole.

Tuff-Tite fasteners won't mar fine finishes and they stop vibration noises and squeaks because the neoprene washer spreads itself completely between fastener head and surface. The washer actually cushions the fastener and prevents metal-to-metal contact.

Leakproof, non-marring, shock and squeak absorbing!
If you need these fastening advantages, you need National Tuff-Tite fasteners. Write for the Tuff-Tite fastener folder describing this line in detail.



THE NATIONAL SCREW & MFG. COMPANY CLEVELAND 4, OHIO

Pacific Coast: National Screw & Mfg. Co. of Cal.
3423 South Garfield Ave., Los Angeles 22, Cal.

Tuff-Tite fastener facts

Standard National Tuff-Tite fasteners are available in hexagonal, pan, round and truss head styles for screw diameters No. 6 to $\frac{3}{8}$ " inclusive ... maximum over-all length $1\frac{1}{2}$ ". Standard fastener types are wood screws, self-tapping screws, thread cutting screws, machine screws and stove bolts. Tuff-Tite fasteners are pre-assembled with neoprene washers.

Washers are molded of neoprene which has a durometer hardness of 85 to 95.

Write for information on special Tuff-Tite fasteners.



Fasteners



Model Chains



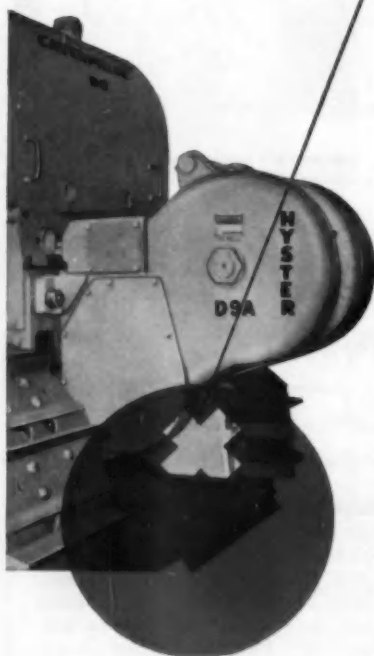
Chester Hoists





Hyster "98" Logging Arch and D9A Towing Winch especially designed for operation with Caterpillar D9 tractors.

by switching to
OSTUCO TUBING
here and here...



Hyster Company Makes Double-Cut on Costs!

Hyster Company, Portland, Oregon, out to beat machining costs of components in their logging arches and winches and a drawbar bracket, turned the trick by switching from another material to OSTUCO Seamless Steel Tubing.

Drawbar Bracket—Use of OSTUCO Tubing cut material and machining costs from \$120,500 to \$81,820 annually for a reduction of 32%.

Logging Arch—Used as sleeves in the Hyster "98" Arch, OSTUCO Tubing reduced material and manpower costs 10% annually.

In addition, Hyster engineers report the equipment is stronger and better able to take the strain of heavy hauling and winching jobs over rough logging terrain.

Perhaps you have hidden profit-robbers in your product. Better contact OHIO SEAMLESS for recommendations... without obligation on your part, of course.

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Seattle • Tulsa • Wichita

CANADA: Railway & Power Engr. Corp., Ltd.
EXPORT: COPPERWELD STEEL INTERNATIONAL COMPANY,
225 Broadway, New York 7, New York

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Vacuum Furnaces

ONLY in the past few years have vacuum furnaces been used to any extent in this country. Without them, metals like zirconium, titanium, and uranium could not be properly purified for production. Generally, these furnaces are thought of only for the degassing, annealing, brazing, or sintering, of the rare-earth metals; but they can be used to advantage for such jobs as brazing stainless steel parts for both the aircraft and automobile industries. One such furnace has been contemplated by an airframe maker and Westinghouse Electric Corp. for brazing a huge wing assembly for supersonic bombers.

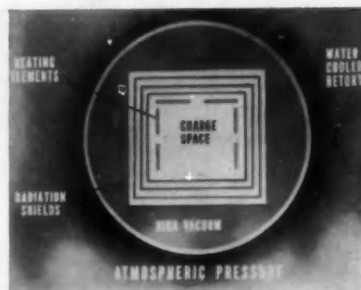
The proposed aircraft wing furnace would be of the cold retort type. This Westinghouse design makes use of radiation shields between the retort and the heat source. The shields act as reflectors to prevent deterioration of the retort which is made of carbon steel. Without the radiation shields, the retort would have to be of the expendable carbon steel type or of Inconel. Graphite retorts are used when the operating temperature goes over 5500 F. The radiation shields are generally made of stainless steel, but other high temperature and highly reflective metals are utilized.

When radiation shields are used, fans can be installed to cool the fur-

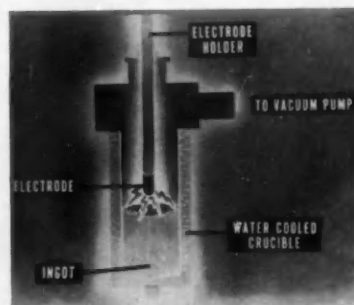
nace when brazing is completed. In the aircraft furnace, six fans are used to circulate an inert gas such as argon or helium. The gas is circulated between the outer radiation shield and the water-cooled shell and back over the work, to provide the fastest cooling method possible.

The aircraft wing furnace would use nickel-chromium elements to take the temperature up to 2150 F with a current draw of about 9000 kw. It would be brought up to 1700 F rather slowly and then be given a rapid surge of current to go up to the 2150 F mark.

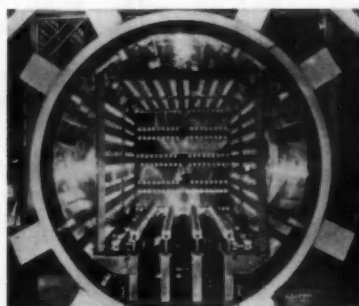
Various types of pumps can be used
(Turn to page 104, please)



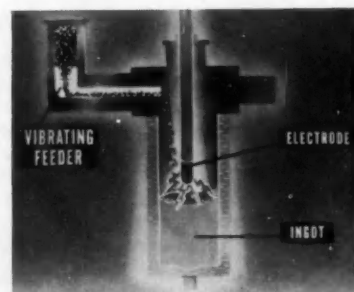
Sketch of a typical Westinghouse vacuum furnace showing nomenclature of various parts



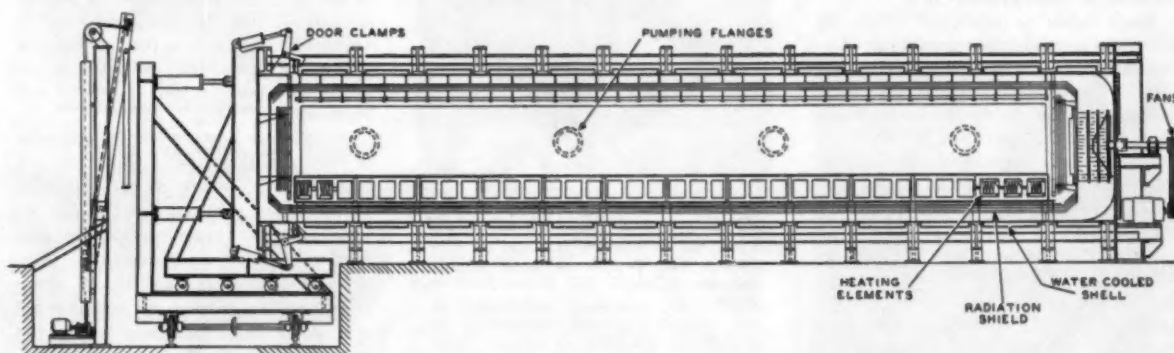
Consumable electrode arc melting vacuum furnace



Westinghouse Kold-Retort vacuum furnace installed at Mallory-Sharon



Non-consumable electrode arc melting vacuum furnace



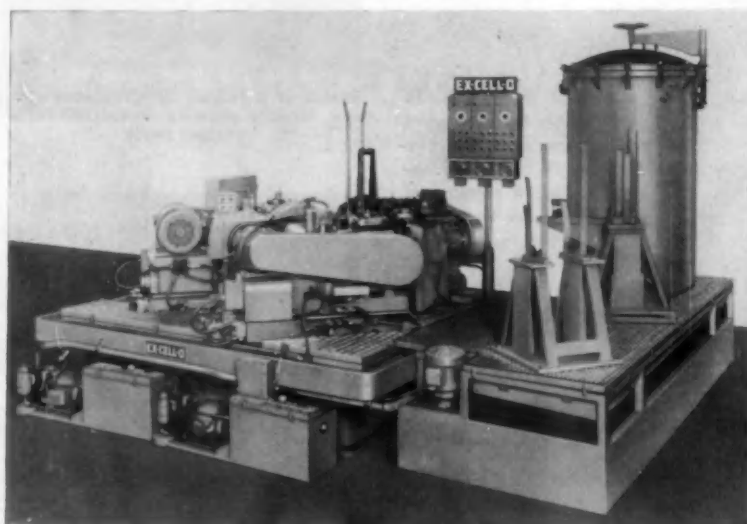
Huge vacuum furnace proposed for brazing stainless steel aircraft wings for supersonic bombers

NEW

PRODUCTION and PLANT

EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Ex-Cell-O three-slide grinder for grinding curved surfaces of jet engine vanes

Grinder Finishes Jet Engine Vanes

A THREE-SLIDE grinder which automatically finishes the curved surfaces of jet engine vane roots has been announced. Five surfaces are ground in one cycle—the OD, two edges, and ID on both sides. The machine is equipped with four grinding wheels mounted on three spindles. Two of the spindles each carry a single wheel, while the third spindle carries two wheels. Three of the wheels are 15-in. diam; the fourth is 20-in. Wheel widths range from $\frac{1}{2}$ to 1 $\frac{1}{4}$ -in. Dimensional tolerances are said to be consistently held.

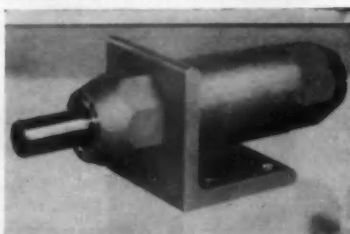
Each slide is equipped with the company's cam-type universal diamond dresser, which shapes the respective wheels as part of the automatic machine cycle. The slides automatically compensate for the abrasive removed when the wheels are dressed. Slide movements include rapid approach, an adjustable fine feed and an adjustable spark-out period.

Two interchangeable trunnion fixtures are furnished with the machine to permit nearly continuous operation. While one fixture rotates the vanes through the grinding cycle, the second fixture is being loaded by the

operator. Loading racks support the trunnions when these are out of the machine. The fixtures shown hold nineteen vanes; more, or less, than this number can be ground per machine cycle depending upon the size and shape of the vanes. *Ex-Cell-O Corp.*

Circle 30 on postcard for more data

Impact Tool Attachment



Marking, light piercing, staking and riveting are said to be simplified by this impact tool attachment for use on drill presses, arbor presses and other existing machines. Called the Impact-Tool, it operates on line pressure as low as 20 lb. and can be actuated electrically by solenoid or manually by poppet valve. (*Air-Impac Co.*)

Circle 31 on postcard for more data

Induction Heaters

INCORPORATING powdered core output transformers, a line of induction heaters just announced is said to make possible ultra-fast induction hardening. A cited specific application is the spring-shackle bolt shown in the photo. The requirement was to harden the knurl to a depth of approximately 0.012 in., without hardening or heating the head of the shank adjacent to the knurl or the shank under the knurl. The pin is driven into a hardened spring and the knurl must be hard to penetrate and hold. The head, however, must be soft enough to take the blow of pounding, without shattering.

The stated problem, therefore, was to develop a new type of heater that



would provide ultra-fast heating. Ordinary induction heating techniques could reportedly provide a minimum heating time of one second with a 20-kw unit. But this time length allowed the shank to be heated, and the only solution to this was spraying with water. By using the ultra-fast induction heater, this same operation may be accomplished in 1/10-sec on a 10-kw machine. Because it is accomplished so rapidly, no quenching is required, the residual cold of the pin doing the quenching; and the knurl is the only portion that is heated and hardened.

With these heaters all the operator is required to do is to push the pin into the coil, where it automatically turns on the machine for the desired time interval (subsequently lengthened to $\frac{1}{4}$ -sec), and remove it. Theoretical output is said to be about 10,000 units per hour. In actual practice, 3500 units per hour have been processed. *Radio Frequency Co.*

Circle 32 on postcard for more data

Hot Work Die Steel

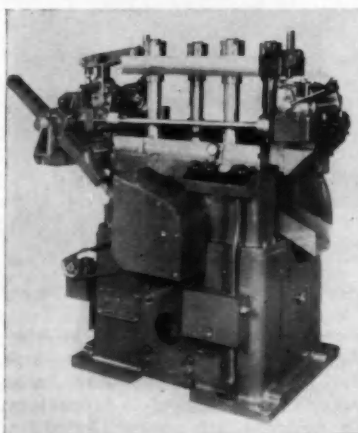
To meet requirements for a tougher die steel for forging high temperature alloys, a company recently revealed that it is marketing a hot work die steel named Jet Forge. The material is a high chromium steel which is said to have given excellent performance during a recent period of on-the-job testing in plants making jet engine blades and buckets.

Although originated for high temperature forging applications, the company expects the new tool steel will prove readily adaptable to many applications calling for toughness, wear resistance and the ability to maintain strength at elevated temperatures. It is available from stock as bars, billets, disks and forgings. *Vanadium-Alloys Steel Co.*

Circle 33 on postcard for more data

High-Speed Press

SPEEDS up to 500 spm are provided by a 30-ton automatic press which was recently announced. Suited for use in blanking large quantities of small parts, its high speed is said to be made possible by a combination of features, including air counterbalance, counterbalanced crankshaft, and low center of gravity. Draw rods are

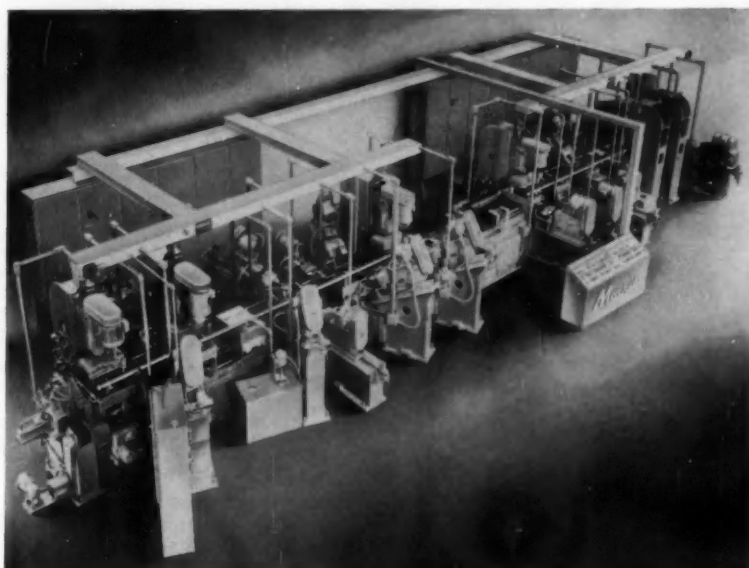


Brandes automatic 30-ton press

guided above and below the crankshaft. A new coil feed mechanism is also said to provide accuracy at the high speeds this press attains.

The unit is only 64 in. high. Standard die area is 10 by 31 in. It is also available in a double throw model with die area 30 by 31 in. *The Brandes Press Co.*

Circle 34 on postcard for more data



Morris in-line transfer machine has 56 stations, performs 90 operations, and processes 480 carburetor bodies per hour

In-Line Transfer Machine for Carburetor Bodies

DESIGNED to process two and four-barrel carburetor bodies, an in-line transfer type machine, incorporating the company's standard production components in a special unit, is said to automatically complete one part every 7½ sec. Fourteen No. 1 Cam-matic, seven No. 2 Cam-matic and four Air-oil-matic drill units are used in performing 31 drilling, 19 boring, 10 reaming, 4 gaging, 13 probing and 13 tapping operations—a total of 90. The machine processes 480 parts per hour, involving 56 stations. Its automatic features include an automatic loading section, which

checks parts and rejects those in improper position. Precision locator holes are drilled and gaged for accuracy at the first station.

Both first and second sections may be operated either individually or as a single unit. Automatic loading and unloading is provided in the center section, where automatic storage also may be provided. After machining, there is automatic delivery of parts to the unloading conveyor. Drill units are mounted on power-driven sliding sub-bases to facilitate tool changing. *The Morris Machine Tool Co.*

Circle 35 on postcard for more data

Lifting Device

CAPABLE of lifting up to 200 lb, the Air-Lift is a portable vacuum-lifting device for handling materials such as sheet metal and glass. A vacuum is created when the device is placed on an object and remains sealed by means of a Neoprene gasket. To release the object the operator presses a handy release valve with his thumb, which causes air to rush in and break the vacuum. In addition to being fast and efficient, it is pointed out that the device cannot mar or scratch the lifted material.

For heavier operations, the company also manufactures a line of pads utilizing the same lifting principle and available in 200, 600, 1000 and

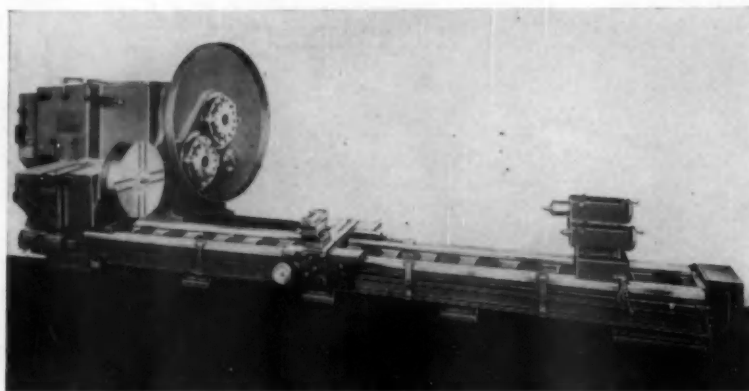
1500-lb capacities. Beams are also obtainable for making up multiple-pad Air-Lifts. *International Staple and Machine Co.*

Circle 36 on postcard for more data



International portable Air-Lift

NEW PRODUCTION and PLANT EQUIPMENT



Boye & Emmes dual spindle lathe handles both large and small diameter work

Lathe Design Incorporates Two Spindles

SUPPLYING facilities in one unit for turning both large diameter and small diameter work, a dual spindle lathe recently introduced has an upper spindle providing a swing-over-the-bed of 60-in. and a lower spindle giving a swing of 40-in. The two spindles are so positioned that the point of contact between work and tool is within easy sight and reach.

The lower spindle is provided with 12 speeds, 6 to 250 rpm. The upper spindle has two ranges of 12 speeds, one 3.6 to 150 rpm and the other 0.8 to 33.3 rpm. Thirty horsepower is available to the lower spindle, the six higher spindle speeds of the upper spindle, and all speeds above 7 rpm when using the face plate drive on the upper spindle.

A feature of the machine is the

operator's ability to engage or disengage the various drives at will, under the protection of a mechanical safety interlock arrangement for preventing machine-damaging movements. An illustration given of the practical application of this feature is the ability to hold work stationary between the upper spindles while an attachment, mounted on the carriage, performs milling or grinding operations throughout the length of carriage travel.

The lathe is built to support 15 tons between centers. Beds may be had in any required length, and in one piece, up to 35 ft between centers. Standard attachments are available and applicable. *The Boye & Emmes Machine Tool Co.*

Circle 37 on postcard for more data

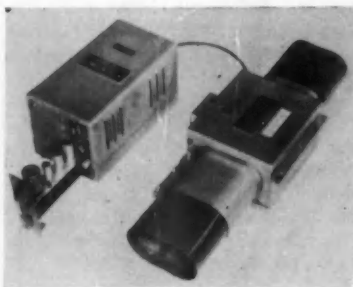
Dispatching System

AN automatic dispatching system, called Magnepulse Dispatcher, is now available for pneumatic tube systems or for transmission of parts, materials or carriers by high-speed conveying means. It enables installation of an economical loop-type system rather than the conventional multi-tube system. It will control carriers traveling up to 30 mph. The dispatcher employs magnetic techniques for coding the destination of each carrier. A carrier may be automatically dispatched to several different stations on several different circuits.

Destination coding is achieved through use of small permanent magnets fixed to the carrier. One selector positions the station magnet for any of 10 stations; another selector positions the loop magnet for the loops. When the carrier is in transit, the position of these magnets in reference

to a first magnet is detected at each loop switching point and station. Detectors consist of magnetic pick-up coils and an electronic control unit. Depending upon the magnet positions, the control unit causes switching or stopping action, or lets the carrier pass. *Gemco Electric Co.*

Circle 38 on postcard for more data



Gemco Magnepulse dispatcher

Cutting Device

CALLED the Aerocutter, a cartridge-actuated cutting device is said to have application in the instantaneous and positive severing of hydraulic or pneumatic tubing, electrical cable, and mechanical parts. A typical cutter, AGX-1800, is designed to cut four stainless steel tubes 1/4-in. diam by 0.035-in. wall thickness while they are pressurized to 150 psi with corrosive fumes. A feature of this unit is that after cutting the tubes so that one cut end may vent to ambient pressure, the cutter swages the other cut ends against an anvil to seal them, thereby preventing further flow in the tubes. The device is fired by electrical impulse which initiates a non-corrosive propellant. It may be reloaded for repeated use.

Sound mechanical design and careful selection of propellant charge are said to result in a safe unit which may be fired in close proximity to per-



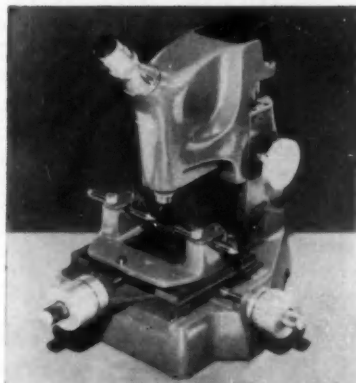
Aerocutter cartridge-actuated device

sonnel or delicate equipment without the use of special protective measures. For special applications, the Aerocutter can be supplied to function in an explosive atmosphere. Actuation of the device, while usually by electrical impulse, can be mechanical for use in strong rf fields, or areas of humidity where electric initiation would prove hazardous. While single reliability is high, the requirements of some applications may demand parallel, redundant firing systems to achieve the ultimate in reliability, and the Aerocutter can be supplied with this feature when necessary. *Aerojet-General Corp.*

Circle 39 on postcard for more data

Toolmaker's Microscope

INTRODUCED for use by machinists and toolmakers in the inspection and measurement of tools, drill jigs, templates, and finished parts, a new microscope is said to provide versatility, sturdiness and accuracy for shop application. Called the toolmaker's measuring microscope, its major advance lies in a unique illuminating system. The illumination source is built in and the beam of light is directed down through the microscope



Bausch & Lomb toolmaker's microscope

objective, giving vertical illumination. A collective mirror under the stage plate reflects the light back into the body tube. As a result, both the surface and the contour of the part may be viewed simultaneously.

Designed for precision measurement in two coordinates, the cross slide stage has a maximum range of two inches in the "east-west" direction and one inch in the "north-south" direction. The stage itself rests on ball bearings and its motion is controlled by two micrometer screws.

Standard magnification is 35X, but different objective and eyepiece combinations may be used to obtain other magnifications. A 7/5X protractor eyepiece, and centers which can be aligned with the eyepiece cross-hair are available for increasing the versatility of the instrument. Bausch & Lomb Optical Co.

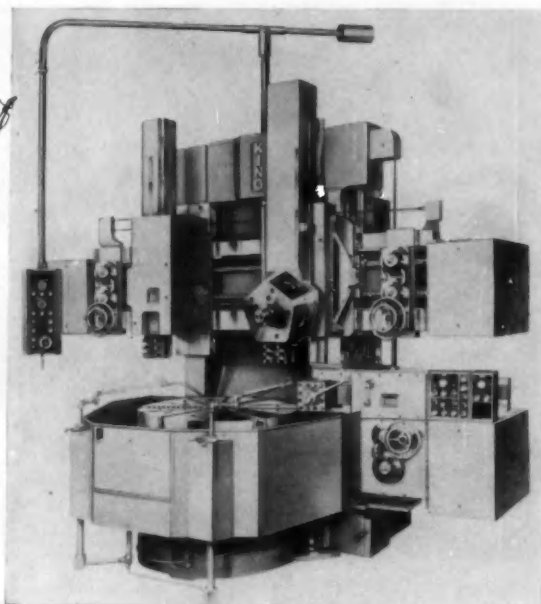
Circle 40 on postcard for more data

Shear-Pin Sprockets

THE availability from stock of roller chain sprockets with shear pin protection, has been announced. This program has been established to meet the need for quick delivery under emergency conditions and to facilitate normal order handling.

Roller chain shear pin sprockets

Electrically - operated, the King vertical boring and turning machine illustrated is a 46-in. size with ram and turret head on rail, side head, and coolant pan. It is one model of a redesigned line available in sizes of 30-in., 36-in., 46-in., 56-in. and up with a variety of head combinations, with or without side head.



Vertical Boring and Turning Machines

VERTICAL boring and turning machines in a redesigned line are said to incorporate advanced construction and operating features for higher accuracy of work and increased production. They are fully electrical in operation. All controls are conveniently located on the movable pendant station and on an auxiliary control panel mounted on the machine.

Both feeds and speeds are preselective from direct-reading dials. Ranges of feeds and speeds have been expanded, providing 24 feeds from 0.0016 to 0.250 in. per table revolution, and 24 speeds in any one of

three standard ranges: low, intermediate, or high. Horsepower has been stepped up to a range of 40 to 50 on 30, 36 and 46 in. sizes; 75 to 100 hp on sizes 56 in. and up.

Among other stated features of the new machines are an improved spindle and spindle mounting for providing maximum table stability with resultant increased machining accuracy; unit construction of spindle drive for easier maintenance; anti-backlash nuts for all cross-feed movements; and automatic lubrication of moving parts. King Machine Tool Div., American Steel Foundries.

Circle 42 on postcard for more data

are for preventing damage to equipment from jamming and other overloads. The shear pin hub is keyed to the shaft and is separate from the sprocket, with torque transmitted from sprocket to hub by a shear pin. When an overload occurs, the necked pin shears at a predetermined value and disconnects sprocket and hub. Link-Belt Co.

Circle 41 on postcard for more data

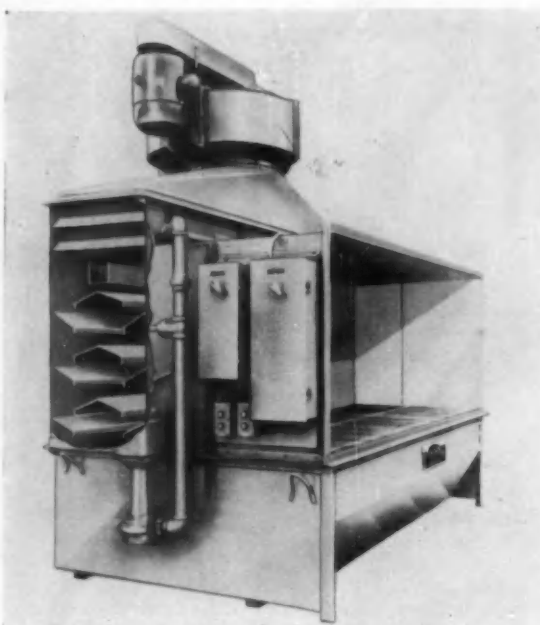
Electronic Counter

COMPRISING an input amplifier, pulse shaper, plug-in electronic decade unit and a five-digit mechanical register, a seven-pound portable electronic counter is said to be capable

of counting rates up to 12,000 per minute. It is stated to meet shop or laboratory counting needs which are beyond the speed of ordinary electro-mechanical counters, but which do not require the counting speed or elaborateness of multi-decade electronic counters.

The counter will respond to electrical pulses of 2.5 v peak, such as derived from a photocell or magnetic pickup, or will respond to ordinary contact closure. Count capacity is 999,999, with a reported accuracy of plus or minus one count. It operates on 105/125-v ac, and has 90-v d-c accessory power available for operation of photocells, etc. Performance Measurements Co.

Circle 43 on postcard for more data



Zack wet-type ventilated grinding bench is said to completely remove abrasive dust and fumes, and to be especially advantageous for application where aluminum-magnesium metals are being processed.

Wet-Type Ventilated Grinding Bench

DEVELOPMENT of a unique wet-type ventilated grinding bench, reportedly engineered for improved efficiency and safety in grinding operations through complete removal of abrasive dust, fumes and particles especially where aluminum-magnesium metals are being used, was

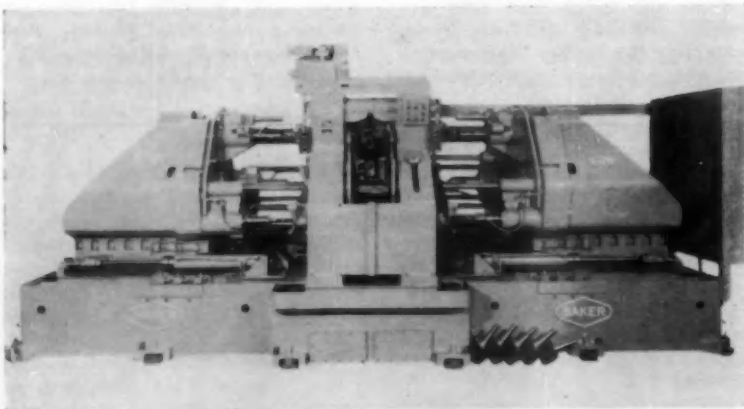
recently announced. It is a self-contained unit made up of a tank for re-circulating water and sludge disposal, a re-circulating pump, an exhaust fan, hardwood grating work surface, and an air-washing chamber.

The exhaust fan is mounted on top and draws the air upward through

the water curtains within the washing chamber. There are six impingement shelves and a dual bank of moisture eliminators within the washing chamber. The eliminators are located above the impingement shelves, acting to remove free moisture from the air.

The contaminated air is drawn down through the hardwood grating and enters the washing chamber just below the lowest impingement shelf. The water or washing agent is pumped from the re-circulating tank and introduced into the washing chamber, at no head pressure, on top of the upper impingement shelf, but below the moisture eliminators. Gravity causes the water to flow downward against the upward flow of the contaminated air. A swirling action is set up by this counterflow of air and liquid, at each of the six impingement shelves. This action brings the upward flow of contaminated air through six stages of wash. By this swirling action, the water is said to be distributed evenly over all impingement shelves and against the side walls of the washing chamber. In this way, it is claimed that all dust particles in the air stream are enveloped and automatically washed down into the re-circulating or settling tank. Fumes can also be removed it is said, by the same counterflow action. *The Zack Co.*

Circle 44 on postcard for more data



Five-Station Machine for Steering Knuckles

Production of 52 forged steering knuckles per hour at 100 per cent efficiency is said to be possible with this five-station trunnion-type machine, which performs core drilling and reaming in an automatic cycle. The heads are specially built, have a 15-hp bevel gear drive, and are mounted on Baker Basic model 1830 standard slides. Twin-pull cylinders for feed are located on the outside of the slides. Hydraulic power is supplied by a separate package. Lubrication is centralized, automatic. (*Baker Brothers, Inc.*)

Circle 45 on postcard for more data

Phosphating Material

THE development of a material for phosphating iron and steel in spray washing machines that imparts an iron phosphate coating of 80 to 120 mg, has been announced. Called CrysCoat No. 47, it cleans and phosphates in a three-stage operation. The compound removes light oils, grease and shop soils and converts the surface of the metal into a thin, dense coating that resists corrosion and gives paint adhesion. Used at 1½ to 2½ oz./gal of water in the first stage of the washing machine, it is followed by a hot water rinse, then by hot chromic acid or CrysCoat FH rinse.

Among the advantages claimed for this new member of a phosphating group are: stability in solution despite minor changes in pH; heavier and faster rate of coating; improved corrosion resistance; and satisfactory cleaning of aluminum, zinc and brass, as well as ferrous metals. *Oakite Products, Inc.*

Circle 46 on postcard for more data

Magnesium Finishing

Two finishing processes have been introduced to provide magnesium with corrosion resistance, abrasion resistance and paint bonding properties. They are said to avoid the need for precise mixing of several chemicals and complicated control procedures.

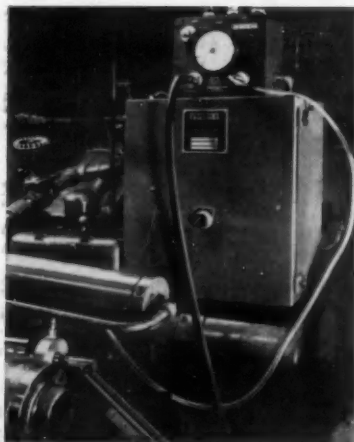
Turcoat 4245-2F is a production-line process for all forms and alloys of magnesium. The one-package powdered material is mixed with water. The same solution may be used for processing by either dc or ac. Hexavalent chromium is the only control required, and the bath is brought back to strength by addition of the original material.

Turcoat 4091 is a liquid process for touching-up coated magnesium that has been scratched or abraded. The process, which does not require electrical current, is also used where assemblies are too large to be immersed. Used as received, the compound is brushed or sprayed onto the surface to be coated. It is also recommended for use in a dip tank to replace chrome pickle. *Turco Products, Inc.*

Circle 47 on postcard for more data

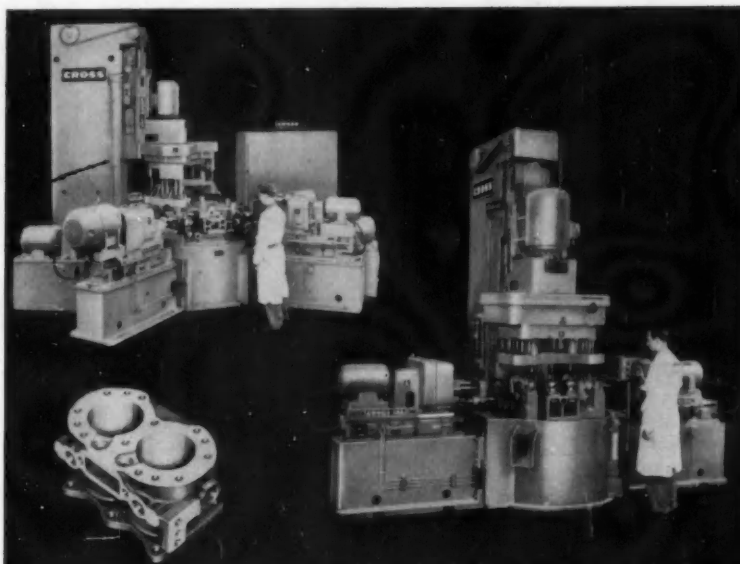
Measuring Gage

KNOWN as Series 493-CG, a newly-developed continuous measuring gage for centerless grinders measures the output and visually indicates any



Federal 493-CG continuous measuring gage for centerless grinders

trend toward out-of-tolerance work, thus permitting as many as three or four machines to be adequately supervised by a single operator. In order that the gage will respond to work-



These two Cross dial-type machines produce 129 air compressor cylinder blocks per hour at 100 per cent efficiency. Also shown is the product, which has been bored, drilled, chamfered and reamed.

Machines for Air Compressor Cylinder Blocks

ARRANGED to process six different air compressor cylinder blocks, a pair of dial-type machines rough and semi-finish bore the cylinders; rough and finish counterbore the valve ports; and drill, chamfer and ream all other necessary holes. To prepare them for the machines, the parts are milled on top, bottom and sides.

The first machine is equipped with a four-station index table, and the second machine with a six-station index table. Indexing is automatic and is fully interlocked with the machine cycle. Both machines are equipped with two-position, progressive work-

holding fixtures with interchangeable adapters for the six different parts. Rated capacity of the two machines is 129 cycles per hour at 100 per cent efficiency.

According to Company engineers, a feature of the machines is their flexibility for part design changes. This is said to be possible because they are constructed on a "building block" principle. Also incorporated are construction to JIC standards, hydraulic feed and rapid traverse, hardened and ground ways, and automatic work cycle. *The Cross Co.*

Circle 48 on postcard for more data

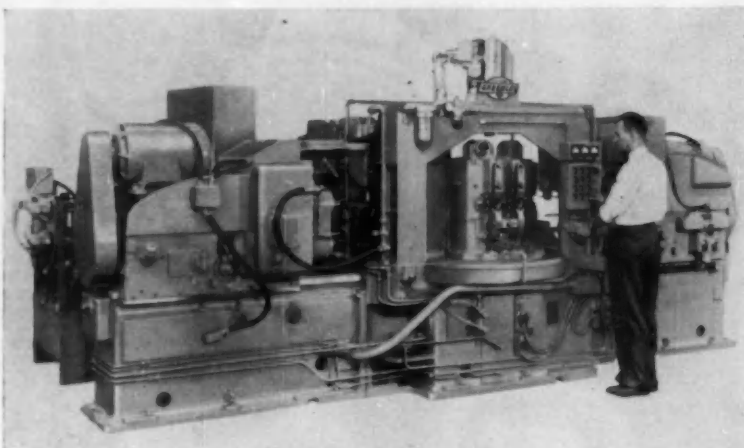
piece size only, ignoring local irregularities such as spaces between workpieces, oil holes, and annular grooves, it incorporates a time delay response which is adjustable in accordance with the speed of work travel and piece length. This time delay provision produces a steady, uninterrupted signal which indicates the condition of the work. It does not interfere with detection of trend toward borderline work size. Large lights on top of the meter-switch unit provide this indication. The gage can also be equipped with audible signals, if desired.

Indicating limits can be set within the spread of the tolerance so that the operator will be signalled before any oversize or undersize work is pro-

duced. The indicating dial is graduated in 0.000050 in. and the air-electric system used in the gage permits indicating limits to operate within plus and minus five millionths of their established settings.

The gage is comprised of standardized components and is normally supplied with an air snap gaging head which can be equipped with various size spacing blocks to suit a variety of work sizes. Alternately, it can be equipped with an air ring gaging head, as shown in the illustration. Both types of heads provide non-contact measurement which places no drag upon the work. *Federal Products Corp.*

Circle 49 on postcard for more data



Greenlee four-station automatic indexing machine handles 84 Diesel engine connecting rods per hour at 100 per cent efficiency

Four-Station Unit Machines Connecting Rods

DEVELOPED for machining Diesel engine connecting rods, a new three-way, four-station, horizontal, automatic indexing machine processes 84 parts per hour at 100 per cent efficiency.

Fixtures are manually loaded with two connecting rods and mounted on the index table located at the first station. The two rods are then auto-

matically clamped into position by a built-in, air-operated torque wrench. Pre-machined centers in each of the rods are used for endwise location in the fixture. The rods are then automatically indexed from station to station by a hydraulically-operated gear and rack mechanism.

Piston pin holes are drilled and the cap side of the rod is bored at the

second station. The rod end is bored and the bolt bosses are milled square at the third. At station four, the piston pin holes are semi-finish reamed, while a sawing operation separates the cap from the rod. The rods and caps are, in turn, unloaded at station one.

Among other features of this machine are a built-in hydraulic system for all stations (conforming to JIC standards), automatic lubrication and chip disposal. All units are electrically interlocked. *Greenlee Bros. & Co.*

Circle 50 on postcard for more data

Pressure Gage Testers

FOR periodic checking of pressure gages where oil, steam, gas and other pressures are of prime importance in the proper operation of equipment, a company is now making its dead weight pressure gage testers available in multiple piston models. These are for covering the wide range of such gages from 1 to 6000 psi, and for allowing low pressure and high pressure testing in small increments. Changeover from low to high pressure testing is said to be simple and done without tools. *Amthor Testing Instrument Co., Inc.*

Circle 51 on postcard for more data

Press Makes Patterns for Investment Casting

SEMI-AUTOMATIC production of wax patterns for investment casting with a mechanical die-closing press, designed for use on Sherwood wax injection presses Models WP-24 and WP-53, is featured in a recent announcement.

The die-closing press operates from the horizontal nozzle of the wax injection press. Platens will accommodate dies of varying size to 6-in. in height and 12-in. square. The press withstands injection pressures of 600 psi up to 50 sq in. of wax surface in the plane of the parting line of the die parallel to the platen. It is fully automatic, with adjustable sequence timed to regulate wax injection and dwell.

The lower platen of the die closing press is adjustable in distance below center of the wax injection nozzle from 1½ to 4-in. A work table surrounds the lower platen and is attached to it. Table height adjusts with platen height.

The operation of the device is in a sequence: (1) platen closes on mold, (2) die-closing press and table

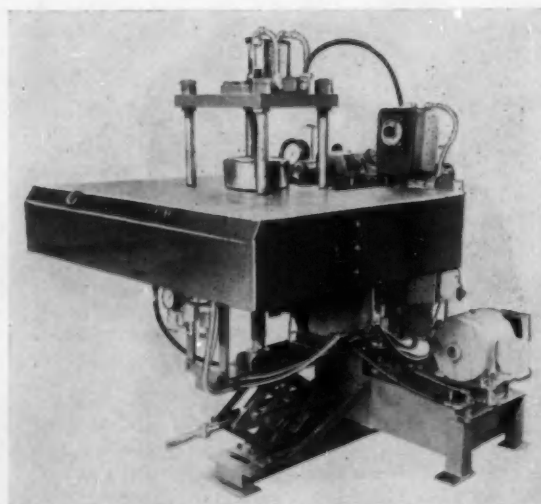
move forward to contact spring-loaded nozzle, (3) nozzle is kept open during required injection and dwell time, and (4) platen retracts and opens to allow removal of mold.

Sequence controls operate on 110-

v ac. Motor for die-closing is ½-hp, operating on 110-v, 60-cycle, single phase ac, or 220-v, 60-cycle, three-phase ac, at user's option. *Alexander Saunders & Co.*

Circle 52 on postcard for more data

Sherwood mechanical die-closing press for semi-automatic production of wax patterns for investment casting. It is designed for use with the company's wax injection presses Models WP-24 and WP-53.

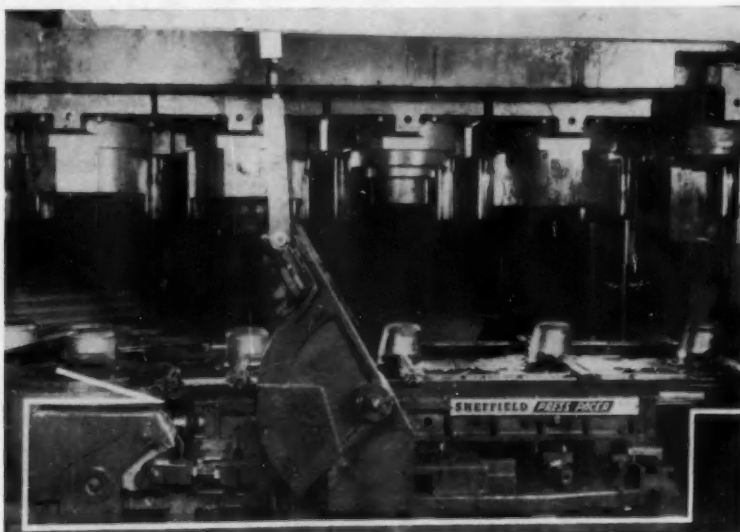


Transfer Unit Automates Standard Presses

THE development of a mechanical transfer unit that converts any standard press into an automated press capable of handling a number of progressive operations and a broader range of sizes was recently announced. Called the "Press Pacer", it is a portable unit that transfers stampings from one die station to the next on each stroke of the ram. It can also be used to transfer parts between presses.

The unit is completely mechanical in operation. There are no electrical, pneumatic, or hydraulic connections or movements. It is capable of moving parts thru a number of die operations such as blank, draw, pierce, and trim simultaneously. The "Press Pacer" is adjustable for different spacings between dies and also for different ram strokes. It can be installed to run either front to back or left to right. The unit is bolted to the bed of the press.

The minimum size press in which the standard model can be used has a bed area approximately 42 by 72 in. and a 14 in. shut height. The standard model has a stroke adjustment up to 12 in. and a transfer distance adjustable to any increment within the 8 to 36 in. range.



Outlined in white is the Sheffield "Press Pacer", a mechanical transfer mechanism adaptable to a wide range of presses. It is capable of transferring parts through sequential operations in a single press or a series of presses.

Essentially the unit consists of a pair of transfer rails, one on each side of the press, on which are mounted opposed pickup fingers that transfer the parts to the next station on each upstroke of the ram. Trans-

fer motion is obtained by means of a lever arm bolted to the ram. The pickup fingers are easily changed to accommodate different size parts. *The Sheffield Corp.*

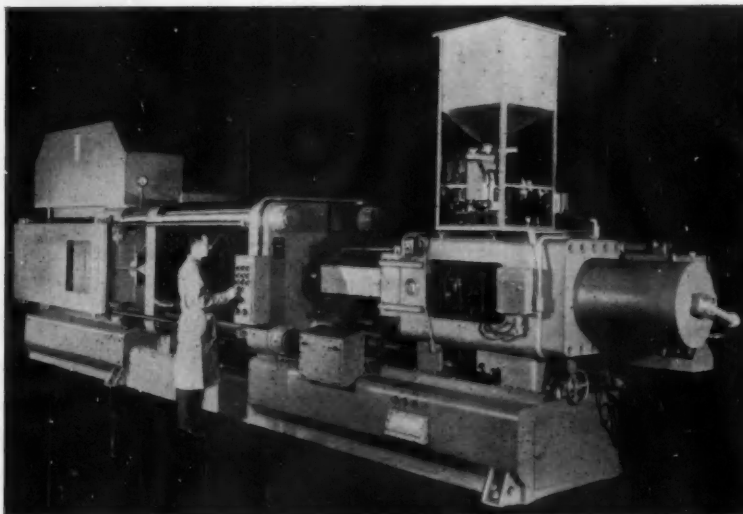
Circle 53 on postcard for more data

Nylon Hammer Faces

THE newest development in a line of "soft-striking" jawhead and solid head hammers is the addition of replaceable nylon faces. The company reports that the nylon faces were selected after testing different types of soft face striking materials. And that the tests established that this specific molded nylon compound possessed superior wearing characteristics.

Other advantages inherent in the nylon material are resistance to acids, oils and moisture. The company states that, like rawhide, these faces will not chip, spark, mushroom nor mar polished or painted finishes. Also, that they will not shrink nor loosen in the head or face bore of the hammer. An added stated advantage of the nylon faces is additional striking surface provided by a new shoulder design where the outside diameter of the face is now flush with the head casting. This feature minimizes danger of sparking caused by the head casting striking work on inaccurate blows. *Chicago Rawhide Mfg. Co.*

Circle 54 on postcard for more data



Plastics Injection Molding Machine

This 48/64-oz machine was developed primarily for molding deep parts such as a 20 1/4-in. polyethylene product, but is still capable of handling average work. It features a 54-in. mold clamp stroke and 84-in. daylight; an injection speed of 2410 cu in./min of material; and a mold mounting area of 36 by 54-in. (The Hydraulic Press Mfg. Co.)

Circle 55 on postcard for more data

Test of Stamina!



IT'S a rugged test for a truck or trailer . . . day in and day out . . . year after year . . . over all kinds of roads, in all kinds of weather.

But TRAILMOBILE knows how to build vehicles that will pass such tests of stamina. And, because of the extreme requirements of their heavy transport equipment, BURTON takes a special pride in supplying springs which contribute so vitally to Trailmobile performance.

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FREE LITERATURE

Die Casting Machines 1

An improved line of cold chamber die casting machines, from 200 to 800 tons, are described in Bulletin 5700, which includes standard and optional equipment. *Hydraulic Press Mfg. Co.*

Thread Gaging 2

A 16-page primer on thread fit and gaging discusses Class 3A threads, and gives the basic rules for measuring pitch diameter tolerances. *Standard Pressed Steel Co.*

Presses 3

Bulletin 13300, eight pages, describes 200, 250 and 300-ton, single and double crank straight side presses, recently introduced, that were designed to meet automotive production standards. *Hamilton Div., Baldwin-Lima-Hamilton Corp.*

Milling Machine 4

A new standard automatic production milling machine that features an index mechanism as an integral part of its horizontal work table, is covered in an eight-page bulletin issued by *The Producto Machine Co.*

Aircraft Fittings 5

Catalog AC-301, 72 pages, contains information on a line that includes aircraft tube fittings, hydraulic cylinders, couplings, hose, and drain valves. *Aviation Div., Weatherhead Co.*

Cut-Off Machines 6

Abrasive cutting machines—fully automatic and semi-automatic for both dry and wet cutting—are shown in Bulletin DH-460-B, four pages, issued by *Campbell Machine Div., American Chain & Cable Co., Inc.*

Honeycombs 7

A comprehensive bibliography of source material on stainless steel honeycombs which lists articles published since 1950 on fabrication, assembly, welding, testing, designing and other aspects, has been issued by *American Silver Co.*

Turks Heads 8

Catalog TH56, 12 pages, contains full details on a line of Turks Head rolling machines, and discusses typical applications. *Fenn Mfg. Co.*

Truck Bodies 9

Methods for fabricating and assembling refrigerated truck bodies with aluminum extruded shapes and parts are discussed in a 30-page handbook issued by *Revere Copper and Brass, Inc.*

Oil Seals 10

Catalog 305, 60 pages, is the latest edition of design and specification data on a series of oil seals. *Victor Mfg. & Gasket Co.*

(Please turn page)

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Conveyor Lubricator 11

An improved line of automatic conveyor lubricators is covered in Catalog CL956, eight pages, which has been made available by *J. N. Fauver Co., Inc.*

Industrial Pumps 12

Detailed information on a line of industrial pumps is given in Bulletin 1100, 12 pages, which includes sectional views, material specifications, and schematic application drawings. *Layne Bowler Pump Co.*

Arc Welding Machines 13

A complete line of arc welding machines and accessories is described in Catalog 1340, 44 pages. Specifications for each machine, from amp ratings to outside dimensions, are included. *Air Reduction Sales Co.*

Hydraulic Shear 14

Catalog 305, eight pages, describes a hydraulic plate shear and includes complete data on controls, construction, and dimensions. *Pacific Industrial Manufacturing Co.*

Drill Stops 15

Improved drill stops with micrometer depth adjustment are described in Bulletin 18-50, four pages, issued by *Scully-Jones and Co.*

Parts Washers 16

Parts washers of the needle-spray type with multiple air jets, for high-volume parts handling, are covered in a two-page bulletin. *Gear-O-Mation Div., Michigan Tool Co.*

Epoxy Resins 17

Technical Bulletin 10, four pages, contains a complete description of techniques involved in using epoxy resin compounds for making models or patterns, vacuum forming molds, dies, jigs and fixtures, and for potting or encapsulation of electrical and electronic components. *Smooth-On Manufacturing Co.*

Tape Recorder 18

Capabilities and characteristics of an instrumentation tape recorder that is designed for use in data acquisition, storage, analysis and reduction, machine and process programming, and dynamic simulation are covered in a 20-page booklet issued by *Ampez Corp., Instrumentation Div.*

Pinhole Detector 19

Bulletin GEA-6520, four pages, provides information on the capabilities and operation of a redesigned pinhole detector for automatically inspecting fast-moving opaque strip for small holes. *General Electric Co.*

Thermostat Controls 20

An eight-page bulletin describes in detail the design, construction and operation of a line of tubular-type thermostats that make or break an electrical circuit by responding to changes in temperature or electrical load. *Franklin Dales Co.*

Stainless Steels 21

An eight-page booklet contains details on types 308, 309, and 310 stainless steel for furnace and elevated temperature applications. *Allegheny Ludlum Steel Corp.*

Motor Pump Units 22

Catalog 107, eight pages, covers a new line of pumps designed for handling heavy fuel oils and highly viscous liquids in industrial applications. *Tuthill Pump Co.*

Electrical Switches 23

Catalog 200, four pages, covers a line of multi-contact, interlocking pushbutton, lever, and turn switches; ratings, dimensions, and other specifications are included. *Donald P. Mossman, Inc.*

Squaring Shears 24

Bulletin 69G, 74 pages, contains information on an entire line of under-drive power squaring shears, including specifications on 59 models with shearing capacities ranging from 16 gage to 1-in. mild steel and cutting lengths from 4 to 20 ft. *Niagara Machine & Tool Works.*

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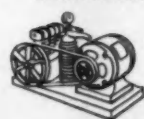
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BEATS VIBRATION IN COMPRESSOR MOTOR



Hex-head, alloy steel cap screw with Nylok insert. Suggests many similar applications in motor driven units.

PROVIDES SAFETY IN AUTO DOOR STRIKER PLATE



Phillips flat-head steel machine screw with Nylok insert. Keeps doors closed in event of collision, resists vibration.

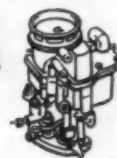
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PREVENTS SCREW "SHEDDING" IN POWER MOWER

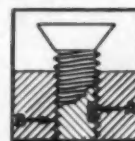


Hex-head, alloy steel cap screw with Nylok insert. Holds wheel to drive shaft. Stops screw loss, customer complaints.

HOLDS ADJUSTMENT IN CARBURETOR



Socket head, alloy steel, cone pointed set screw. Resists vibration, heat, and effects of fuel contact.



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Resilient nylon plug (A) sets up a lateral thrust, smoothly wedges mating threads together (B). All locking action is on threads: head is not stressed. Locking is positive . . . seated or unseated.

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Can be removed and replaced
Interchangeable — reusable
Locks seated or unseated
Acts as seal for gases, liquids

CHECK YOUR ASSEMBLIES Find out where Continental cost-saving ideas, like Nylok, can cut your assembly costs. Continental Assembly Specialists are fully qualified to analyze your operations and advise which fasteners — *standard or special* — can save you most. For prompt service, write or phone: Continental Screw Co., 451 Mt. Pleasant St., New Bedford, Mass.

CONTINENTAL SCREW COMPANY, NEW BEDFORD, MASS. HOLTITE FASTENERS

PHILLIPS AND SLOTTED HEAD TAPPING SCREWS,
WOOD SCREWS, MACHINE SCREWS, SEMS, BOLTS, NUTS
STANDARD OR SPECIAL . . . FOR ANY ASSEMBLY



NEW

PRODUCTS

AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Hydraulic Power Unit

Comprising a 6 (or 12) volt d-c motor drive, pump, control valve, and tank, a self-contained hydraulic power unit is designed for applications on mobile equipment, hoists, booms, tail gates, etc. Now in production, it is named the Lectrolift.

The reservoir, for 110 cu in. of oil, is a rectangular housing of cast



aluminum. The electric motor is flange-mounted to one end of the housing and the pump control valve to the opposite end. All working parts are totally enclosed and permanently lubricated for protection from outside elements. The one-lever control can accommodate a clevis for remote control linkage; and has three operating positions—raise, lower and spring-return to hold. Lowering control is through a throttling valve for varying rate of return. The unit may be mounted vertically, with motor end up, or horizontally. *Wisconsin Hydraulics, Inc.*

Circle 60 on postcard for more data

High-Temperature Alloy

A new high-temperature nickel alloy which is expected by its maker to find wide use in jet engine combustion systems was recently announced. To be marketed under the trademark Incoloy "T", it is a titanium-containing nickel-iron-chromium alloy produced as a strong sheet material and designed to operate at temperatures up to 1400 F or even higher in some applications. It contains about one

percent of titanium; and is said to have excellent oxidation resistance at temperatures up to 1600 F.

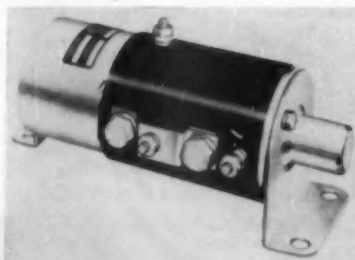
Incoloy "T" sheets as produced are annealed at 1900 to 1950 F. It is reported that fabricators using the alloy have obtained a good combination of formability and strength by process annealing components at 1800 to 1850 F from 20 to 30 minutes, followed by rapid air cooling. For properties at temperatures below 1200 F, the tensile and rupture strengths can be improved by cold working. Since, however, the alloy is usually applicable where attachment by welding is necessary, cold working is not recommended. *The International Nickel Co., Inc.*

Circle 61 on postcard for more data

Starter Switches

Heavy-duty series-parallel switches are in a line recently announced that includes both 12 and 24-v models. They make possible the use of 24 v for the starting motors on vehicle and other engines having 12-v systems; and are applicable with cranking motors up to 20 hp and generating systems up to 180 amp. A single unit series-parallel switch replaces two switches in the usual series-parallel system with Bendix drive.

Additional features include either



splashproof or waterproof construction; and a design which is said to prevent short-circuiting from contact welding. Simplified wiring and less current requirement are also stated advantages. *Leece-Neville Co.*

Circle 62 on postcard for more data

Missile Fuel Pump

Announcement has been made of a fuel pump for missile applications, designed for pumping low-viscosity, low-lubricity, highly-corrosive propellant type fluids, such as normal propyl



nitrate. At 260 F it will pump the latter at the rate of 0.5 gpm.

A low pump weight to discharge-flow ratio is said to be achieved by high-speed operation of balanced symmetrical parts. The ball piston concept is used in the design, providing a rolling contact and a minimum of moving parts. A feature of the pump is the cylinder block bearing which allows high-speed operation with fluids having low lubricity. Corrosion-resistant materials are used, permitting high-temperature operation with various missile fuels. *General Electric Co.*

Circle 63 on postcard for more data

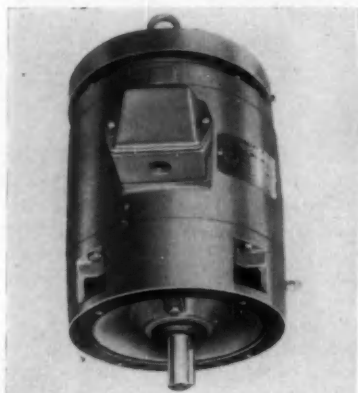
Adapter Union

Offered for eliminating turbulence and friction with consequent loss of pressure, a "turbulence-free" adapter union has a rounded inner bore to provide a smooth radius and flow. The male end of the "TF" adapter union is also tapered to avoid a shoulder at the juncture of the adjacent fitting. It is available in 45 and 90 deg. *Eastman Mfg. Co.*

Circle 64 on postcard for more data

Vertical Shaft Motors

Vertical solid shaft P-base motors for vertical pump installations, in a complete line, have been introduced. The new motors, with normal thrust bearings in all sizes from 1 to 40 hp and high thrust in sizes from 1 to 15 hp, are available in protected, totally-



enclosed, or explosion-proof enclosures. The standard enclosure for explosion-proof P-base motors is said to meet Underwriters' Laboratories specifications for performance under conditions covered by Class I, Group D, and Class II, Groups E, F, and G.

Designed for indoor and outdoor installations, the motors are corrosion-proof for long, safe operation under adverse conditions frequently found in the process industries. The shaft is sealed by a neoprene slinger that protects bearings and windings from foreign matter. The mounting flange face and rabbet fits are machined after assembly for mating with the pump flange and to provide positive alignment. "Metermatic" lubrication automatically regulates the correct flow of lubricant to the bearings. Grease relief prevents damage from grease pressure or over-lubrication. *Reliance Electric and Engineering Co.*

Circle 65 on postcard for more data

Nameplate Adhesive

Strong, permanent fastening of metal nameplates to wood, metal and ceramic surfaces is said to be obtained with a resin adhesive known as Resin XV. A one-component solvent type material, it is applied to the reverse side of the nameplate. This can be done on a continuous line basis, followed by air drying. When adhesive film becomes dry it loses its tackiness. Then when ready for application, the nameplate is momentarily heated 250

to 300 F and while still hot, pressed firmly against the clean surface on which it is to adhere. The bond is completed upon cooling. *Furane Plastics Inc.*

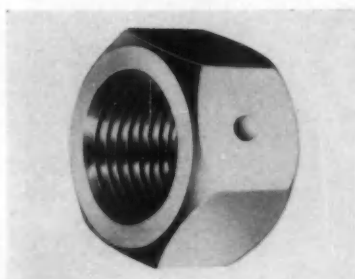
Circle 66 on postcard for more data

Two-Way Lock Nut

The addition of a two-way lock nut to a line has been announced. It is double chamfered and will start from either end. The new nut has its locking power in the body, not at the crown.

The two-way nut may be automated without the use of selective devices. Another advantage claimed is that with the point of lock in the body of the nut, it is a better, more positive lock when bolt ends are flush with the nut, or even when all the threads are not utilized.

Pressure applied on opposite sides in manufacture gives opposing thread deflection, as well as an ovalizing in the center, but not at the ends of the thread. This allows a 180-deg spring



for holding power and torque consistency, highly important in maintaining a smooth production line. *MacLean-Fogg Lock Nut Co.*

Circle 67 on postcard for more data

Zinc-Clad Aluminum

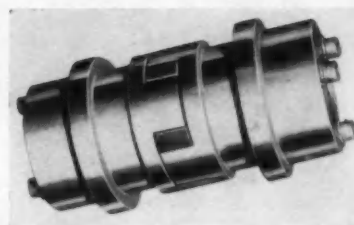
Now available for the first time commercially is zinc-clad aluminum alloy, designated Alcoa Soldering Sheet. Fabricated with one or both sides clad, it is obtainable in coil or flat sheet form. The product is expected to help solve many joining problems, particularly in the cooling radiator field, and to open the way to many aluminum applications yet untried. Used with specially-developed soldering techniques, it is claimed to simplify maintenance and repair of soldered assemblies, in addition to reducing production costs. *Aluminum Co. of America.*

Circle 68 on postcard for more data

Flexible Coupling

Radially removable, a flexible coupling has been developed which provides a simple means of disconnecting two units without axial movement of the shafts. All that is necessary in such cases is to disassemble the coupling itself, which is called Type RRL.

Ratings range from 7.5 to 40 hp at 1800 rpm. Bores range from 1½



to 2¼ in. max; OD from 29/16 to 5 in. max. Overall length runs from 6 1/8 to 7 5/8 in. max. *Lovejoy Flexible Coupling Co.*

Circle 69 on postcard for more data

Remote Positioner

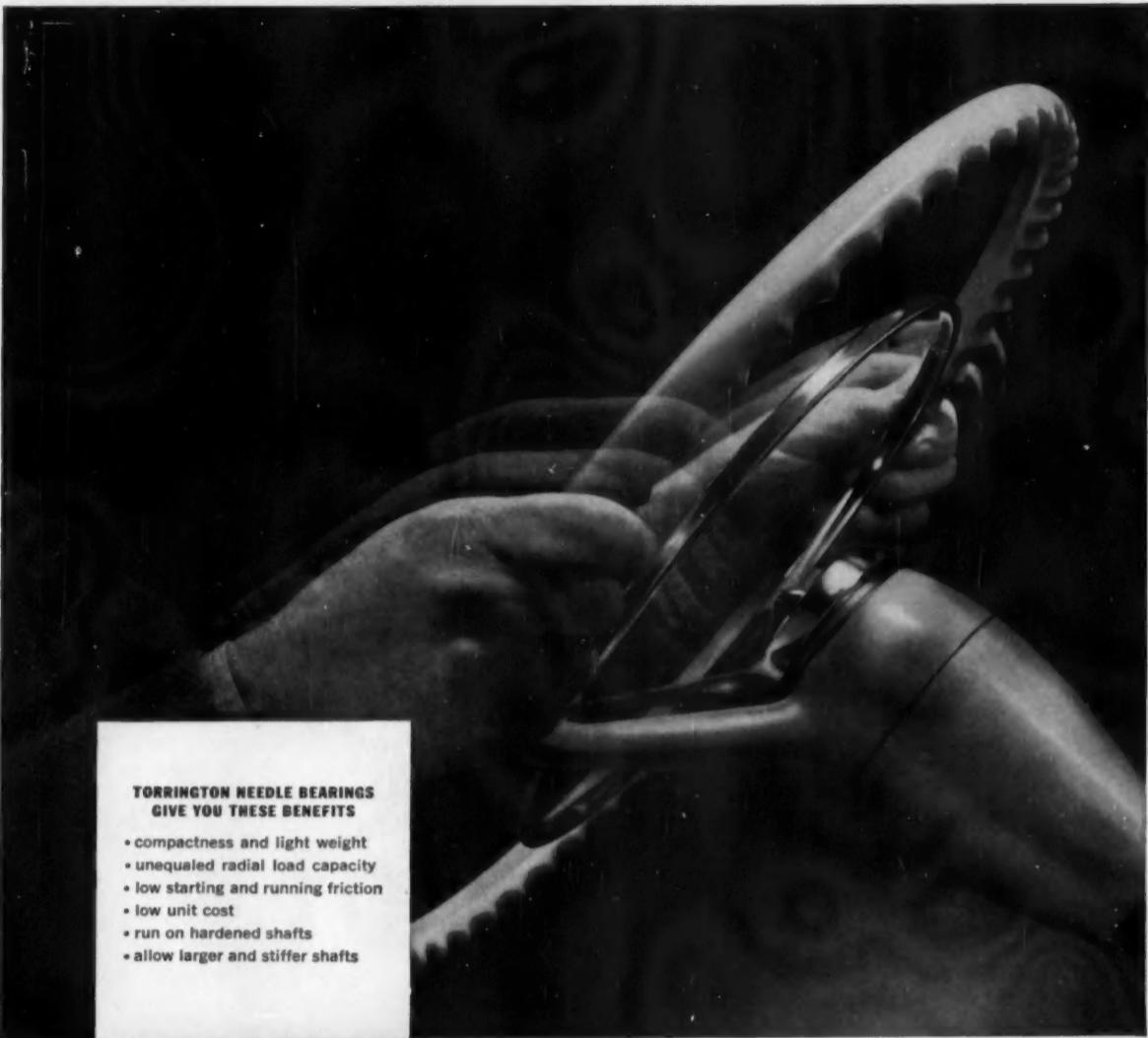
A new remote positioning system for transmitting motion with output power has been announced. The system is composed of three basic components: a transmitter, amplifier, and receiver. It is said to have been designed for maximum reliability, and that it will either operate under any reasonable failure or remain in position.

Any form of motion can be transmitted or received, either linear or rotary. Power supplies of amplifier and receiver need not be identical; amplifier requires 115-v, 400-cps supply, but the receiver motor may operate on practically any power supply available. Input-output ratio can be 1:1 or any other desired ratio.

Accuracy of the system is stated to be independent of load because the receiver motor gets full voltage for any error signal exceeding the dead-band, which can be as low as 0.2 per cent of scale. Manual over-ride, inching control, and interlock features are available as options.

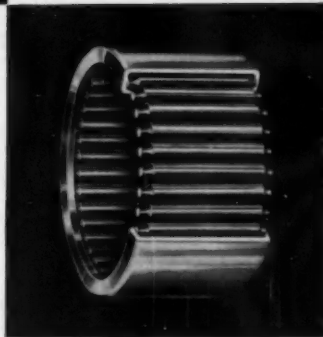
Applications for the systems include fuel mixture and throttle control on engine test cells, valve operation in process work, and remote manipulation in hazardous locations. Airborne applications are powerplant control, secondary flight control surfaces, and others. *The Bristol Co.*

Circle 70 on postcard for more data



**TORRINGTON NEEDLE BEARINGS
GIVE YOU THESE BENEFITS**

- compactness and light weight
- unequaled radial load capacity
- low starting and running friction
- low unit cost
- run on hardened shafts
- allow larger and stiffer shafts



Many good turns a day!

Power steering has brought new ease and simplicity to driving. In power steering mechanisms, Torrington Needle Bearings have brought simplicity and economy of design, assembly and maintenance.

Especially preferred for this type of application, Needle Bearings offer unusual service dependability with a compactness unequaled by any other anti-friction bearing of comparable capacity. Compact in themselves, they also contribute to compact housing design and the use of larger, stronger shafts. They retain lubricant effectively, minimizing service requirements.

Such features have led to the use of Torrington Needle Bearings in a variety of automotive applications; transmissions, steering knuckles, brakes, clutches, hydraulic pumps and many others. For engineering assistance, talk to your Torrington representative. Catalog on request. THE TORRINGTON COMPANY, Torrington, Conn., South Bend 21, Ind.

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AUTOMOTIVE INDUSTRIES, February 15, 1957

AIR BRIEFS



By RALPH H. McCLARREN

Requirements of Aviation in the Future

Edward P. Curtis, who is Special Assistant to President Eisenhower for Aviation Facilities Planning, was the guest speaker at Honors Night Dinner of the Institute of the Aeronautical Sciences held in New York on January 28. He commented upon the requirements of aviation in the future and the comprehensive study being conducted to determine the nation's aviation facility needs for a generation to come. His formal report to the White House will be made this spring.

Mr. Curtis emphasized the immediate need to implement the present air traffic control system especially to more effectively handle the ever-increasing volume of air traffic. This must be done on an interim basis to adequately serve the jet transports, which will be placed into operation beginning in 1959, and the urgency of an entirely new system of air traffic control to handle the requirements in 1975. In 1975 it is expected that the present volume of commercial air traffic in the United States will be doubled and the amount of corporate and private flying will increase four fold. This, coupled with a vast increase in helicopter taxi and short-haul aircraft service, will necessitate a new concept to handle the traffic, control it and to assure adequate ground and terminal facilities.

Many, in fact the great majority, of traffic control functions will have to be done automatically, by machines and not by traffic controllers.

Four such essential and time-consuming activities are:

1. Immediate situation display of all aircraft in any one control area.
2. Automatic reporting and determination of the aircraft's position.
3. Flight data transfer from controller to controller.
4. Control instructions to aircraft.

Such automatic functions will relieve controllers of clerical duties and provide

more time for them to make those judgments which no machine can make and are so necessary to the safe and expeditious handling of air traffic.

Honors Bestowed by IAS

At its 25th annual meeting in New York City, the Institute of the Aeronautical Sciences recognized many who made outstanding contributions to the advancement of aviation.

Harry F. Guggenheim, senior partner of Guggenheim Brothers, mining and metallurgical firm, was elected an Honorary Fellow of IAS, the highest honor bestowed by the Institute. Air Commodore F. Rodwell Banks, director of the Bristol Aeroplane Co., Ltd., Bristol, England, was awarded similar honors. Ross Gunn, Director of Physical Research, U. S. Weather

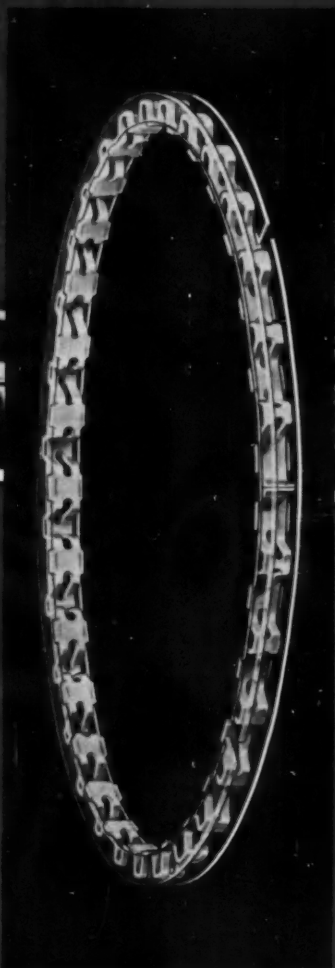
(Turn to page 172, please)

Personal And Executive Aircraft Shipments

Company and Model	No. Aircraft Shipped			Manufacturer's Net Billing Price (in thousands of dollars)		
	Jan.-Nov. Total	November	October	Jan.-Nov. Total	November	October
Aero Design						
680-A	51	3	2	10,597	573	1,546
680	95	9	18			
Beech-Bonanza	426	19	34			
D 18 S	9	—	—			
E 18 S	100	11	9	26,804	1,947	1,614
Twin Bonanza	113	3	5			
Model 45	25	10	7			
Cessna						
Model A4	15	—	—	83	—	—
Cessna						
170B	72	—	1			
172	1,379	99	97			
180	483	18	20			
182	849	30	63	35,452	1,839	2,745
195B	6	—	—			
310	211	12	17			
325	2	—	—			
Mooney						
Model M18C	9	—	—	991	51	53
Mark 20	65	5	5			
Piper						
Super Cub	661	61	45			
Pacer & Tri Pacer	1,070	99	71	21,282	2,096	1,549
Apache	400	38	31			
Taylorcraft						
Model 20	32	4	2	316	38	18
TOTAL	6,085	410	440	95,256	6,835	7,725

Source: The Utility Airplane Council of the Aircraft Industries Association.

THE MOST AMAZING OIL RING IN AUTOMOTIVE HISTORY!



Sealed Power

SS-50U

Stainless Steel OIL RING



ALL THESE MATERIAL ADVANTAGES:

Full tension at operating temperatures. This stainless steel holds room-temperature tension while operating at engine temperature. Carbon steels lose tension at such heat.

Highly resistant to corrosive elements found in internal combustion engines.

Exceptionally long wear. With use, stainless steel hardens and develops more resistance to wear. This means longer life than carbon steels deliver.

PLUS THESE DESIGN ADVANTAGES:

Maximum oil control. Uniform high radial pressure against the cylinder wall assures efficient oil distribution.

Side-sealing. Axial pressure of the stainless steel expander forces side rails snugly against sides of groove, preventing oil waste due to high vacuum.

Independent of groove depth. Circumferential pressure of the expander makes the ring conform to the bore without touching bottom of groove.

Quick-seating chrome rails. Sealed Power's method of chrome plating steel side rails assures fast break-in and more than double ring life.



SEALED POWER CORPORATION • MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA • STRATFORD, ONTARIO

DETROIT OFFICE • 7-236 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440

Sealed Power Piston Rings

PISTONS • CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings Since 1911

Largest Producers of Sealing Rings for Automatic Transmissions and Power Steering Units

The BUSINESS PULSE

Short-Term Outlook Appears to Be Promising as Pattern of Business Activity Continues at Previous High Levels. Business Analysts Are Sharply Divided Over the Probable Economic Impact of President Eisenhower's Budget Proposal

This Survey Is Prepared
exclusively for **AUTOMOTIVE
INDUSTRIES** by the Guaranty
Trust Company of New York

So far in 1957 there has been little visible change in the pattern of business activity. The high levels of employment, output, income, and sales that prevailed in the latter months of 1956 have obviously carried over, but so too have many troublesome uncertainties.

There is still no firm indication, for example, as to whether last year's declining trend of profits has been arrested. Until this situation is clarified some doubts will inevitably linger regarding the duration and vigor of the investment boom. Moreover, the probable strength of the demand for new-model automobiles continues to be an unknown factor, with little prospect that the outlook will crystallize before spring.

The probable pattern of residential construction activity over the course of 1957 is likewise still uncertain. Increasing discussion of a possible letdown in the rate of steel operations by the second quarter of the year has been a damper on optimism, especially since it has been accompanied by a decline in steel scrap prices, whose movements are widely regarded as harbingers of future production trends in steel. Nor has sentiment been buttressed by the announcements by some large corporations of cancellation of some specific plans for expansion.

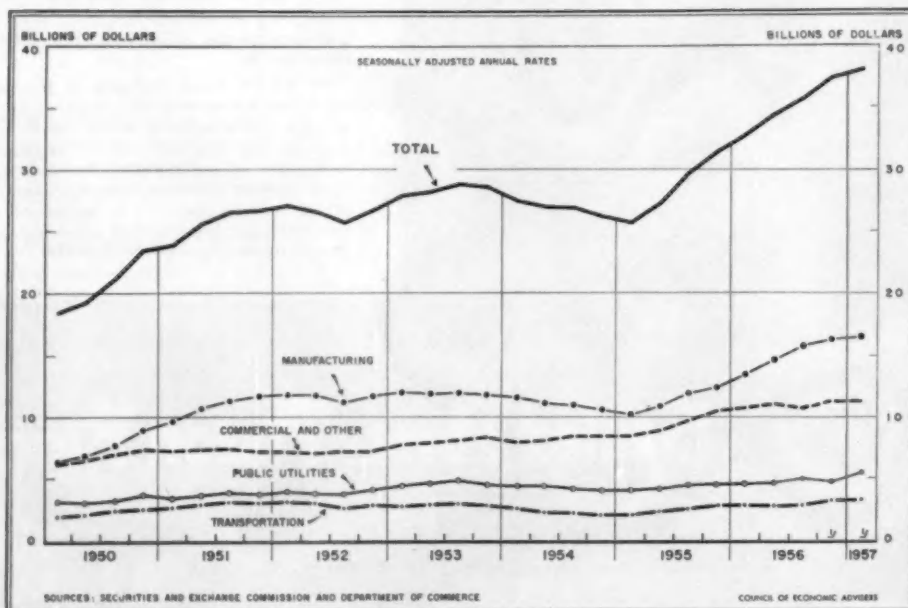
Near-Term Outlook Promising

None of these things, either individually or in combination, necessarily signifies an end to the business boom in the months immediately ahead. Indeed, the near-term outlook is generally regarded as promising, owing in part to the high momentum already achieved and in part to the existence of some forces that are regarded as being of a positive nature, such as the

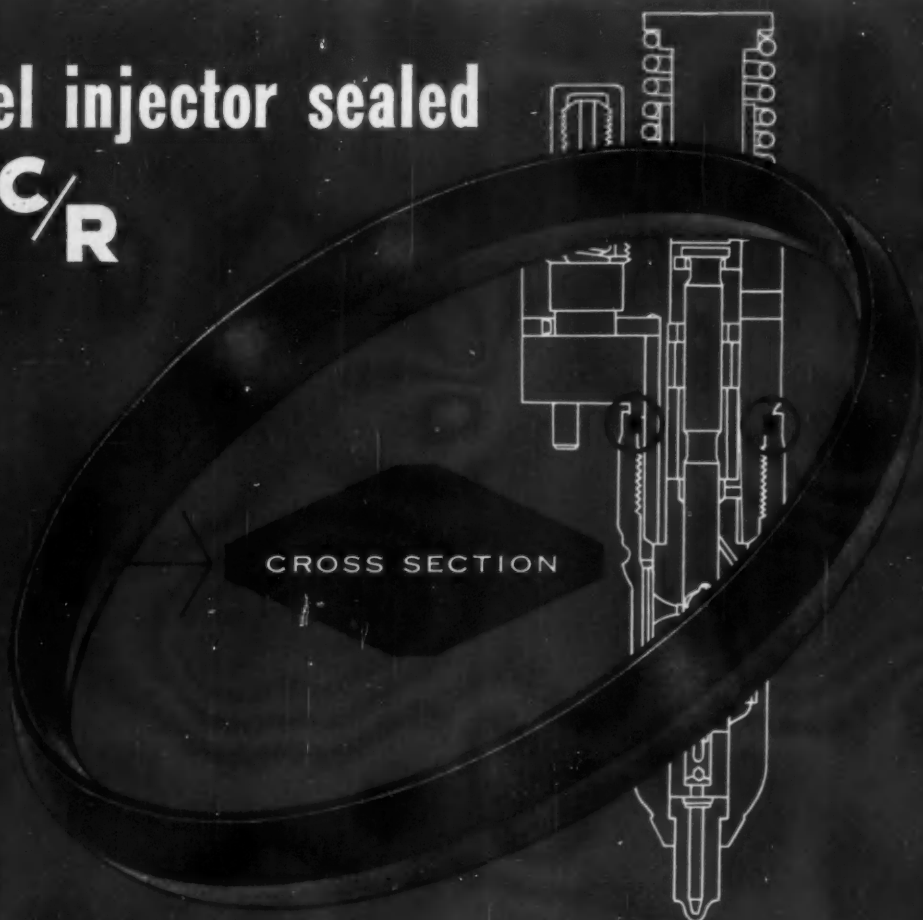
(Turn to page 130, please)

EXPENDITURES FOR NEW PLANT AND EQUIPMENT

The October-November survey of business expenditures on plant and equipment indicates a continued increase in outlays at a reduced rate through the first quarter of 1957



Fuel injector sealed by C/R



ELIMINATES INJECTION NOZZLE LEAKS

Crankcase dilution can be a big headache. But not for one of the leading Diesel manufacturers. They knew that the right injection nozzle seal would cure a major cause . . . and came to C/R Sirvene engineers for help. C/R manufactured this Sirvene (synthetic rubber) part to extremely critical dimensions and physical properties to match the equally precise dimensions of the assembly. Result: no more leakage. When you need a pliable mechanical part compounded to meet critical specifications of heat, pressure, abrasion resistance and molded to the most exacting tolerances, you need C/R Sirvene. C/R Sirvene engineers will gladly cooperate

with you in all phases of your sealing problem . . . from design, compounding of the correct oil-resistant elastomers, through laboratory-like control of production quantities. Write for your copy of the new booklet, "Sirvene."

CHICAGO RAWHIDE MANUFACTURING COMPANY
1205 Elston Avenue, Chicago 22, Illinois

Offices in 55 principal cities. See your telephone book.

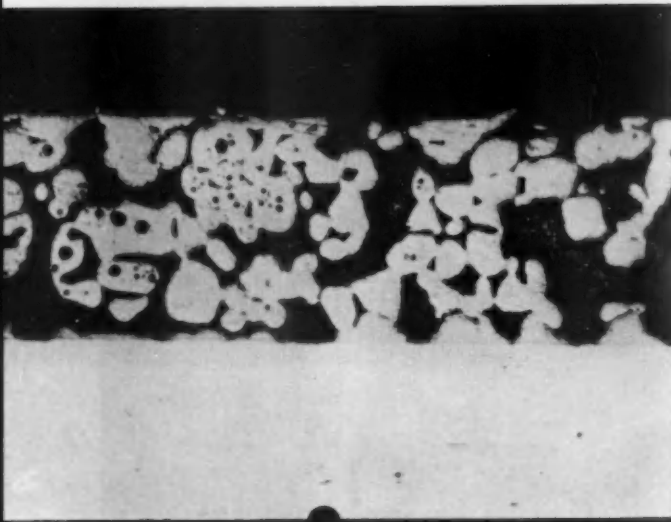
In Canada: Manufactured and Distributed by Chicago Rawhide Mfg. Co. of Canada, Ltd., Hamilton, Ontario

Export Sales: Geon International Corp., Great Neck, New York



Other C/R Products

C/R Shaft and End Face Seals • Sirvis-Conpor mechanical leather cups, packings, boots • C/R Non-metallic Gears



Microphotograph (100x) of cross-section of Cyclon bearing. The solid white area is the steel back; the spongy area is the matrix; the black within the matrix is the babbitt alloy.

AN advanced type of steel-back, precision engine bearing is being readied for use in passenger car and light commercial vehicle engines by Detroit Aluminum and Brass Corp. In performance and cost the new bearing falls between the heavy duty copper-lead type at the top end and the conventional high-lead babbitt bearing at the lower end.

Known as the "Cyclon" bearing, it consists of a porous matrix of copper-base alloy sintered onto steel strip. After sintering the strip enters a molten bath of lead-tin babbitt, permitting the babbitt to completely permeate the porous matrix by capillary action. Finally, the bearing is given a flash coating of tin plate, either before or after broaching to size, to afford protection against rusting.

It may be noted that despite the use of copper-base matrix it is not necessary to employ hardened pins and journals on the crankshaft, thus contributing additionally to cost economy.

Although the Cyclon bearing is not yet in regular production, it has been subjected to durability testing in a variety of makes of V-8 and six-cylinder engines for acceptability. The conventional endurance test cycle of 100 hours at 4400 rpm wide open throttle employed in these tests is said to have indicated in every instance that the bearing is fully capable of meeting operating conditions without fatigue failures and without showing any shaft or bearing wear.

According to the company this type of bearing has

excellent conformability to the journal and exhibits a high degree of embedability, thus coping successfully with dirt and impurities by virtue of the porous structure of the matrix.

Another important feature is high load-carrying ability, intermediate between copper-lead and high-lead babbitt. In fact, for equal bearing areas, Cyclon has about 50 per cent more load-carrying capacity than a good high-lead babbitt bearing.

Cyclon bearings will be produced in the new plant at Bellefontaine, Ohio. It is of general interest that the company produces its own metal powders, the matrix powder being a homogeneous mixture of copper, lead, and tin in definite proportions. Metallurgical control is implicit in producing these bearings. For one thing, the properties of the matrix require control not only of the metal powder but also of grain size. Grain size is selected by screen analysis, rejecting certain fines to assure the desired porosity of structure.

Similarly, precise temperature control is exercised in the sintering operation, the material being held accurately at around 1600 F.

Close metallurgical control also is maintained in the molten babbitt bath. First of all, it must have a correct mixture of lead and tin of specification quality. Then it is held at a precisely designated temperature. Penetration of the material within the matrix is controlled additionally by the speed of the strip through the bath.

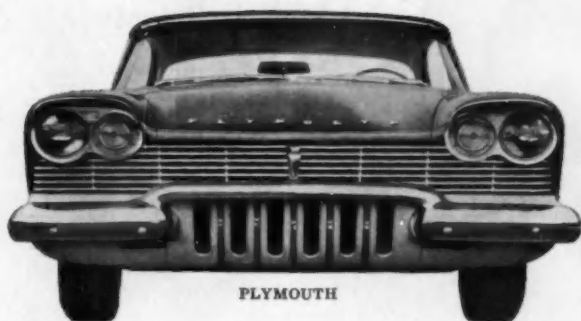
At the present time large experimental production runs are contemplated for service testing by prominent motor car builders.

Survey Shows 20 Taxes Paid on Cars in Michigan

The Michigan Automobile Dealers Association has done an excellent job

in publicizing the automotive tax burden on motorists. Its 1956 fiscal year survey shows that 37.3 per cent of Michigan's total revenue is derived

from automotive taxes and totals \$283.2 million. It notes that 20 separate taxes are paid on a motor vehicle.



PLYMOUTH



DE SOTO



CHRYSLER



DODGE

Each one of the beautiful '57 Chrysler Corporation cars features Enjay Butyl weather-stripping on the big, wrap-around windshield and rear window. With Enjay Butyl's outstanding resistance to aging, moisture and sunlight, you can count on perfect performance for the life of the car.



IMPERIAL

FRONT AND REAR... ENJAY BUTYL RUBBER WEATHER-STRIPPING SEALS FOR SURE!

Come rain or shine, Enjay Butyl, the weather-proof rubber for window weather-stripping out-performs and out-lasts *all other rubbers*, synthetic or natural. *Moisture-proof and impervious to sunlight*, this is the rubber that combines outstanding shock resistance with unparalleled life-expectancy.

In more than 100 places on today's new cars, Enjay Butyl has demonstrated its profitable advantages over all other rubbers. Under the hood... in chassis and body... parts made from this super-durable, all-weather rubber have helped make today's new cars safer, more comfortable, and mechanically more sound. For further information, and for expert technical assistance, contact the Enjay Company.



Enjay Butyl is the greatest rubber value in the world... the super-durable rubber with *outstanding resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.*



Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.
Akron • Boston • Chicago • Los Angeles • New Orleans • Tulsa

AUTOMOTIVE INDUSTRIES, February 15, 1957



Where else can **DUREZ PHENOLICS** do the job best ?

For more than 20 years the water pump impeller of molded phenolic plastic has proved so dependable that most car owners never hear of it. Dimensionally stable, impervious to anti-freeze and anti-rust solutions, it performs like new for the life of the vehicle.

In your continuing search for new and better materials, lower unit cost, faster assembly, and longer wear, have you investigated the properties that

make Durez phenolics outstanding for many automotive components? Electrically non-conductive and chemically inert, they withstand heat and impact in high degree, mold readily to any shape, and need little or no finishing.

New thermosetting plastics developed by Durez with glass fiber and other reinforcing fillers offer these properties in remarkable combinations. Check with your custom molder or call on our field service for help.

OUTSTANDING PROPERTIES OF PHENOLICS INCLUDE:

- Dimensional stability
- Non-conductivity
- Resistance to heat and cold
- Impact strength
- Resistance to moisture
- Chemical resistance
- Moldability in intricate shapes
- Moderate cost



® Phenolic Plastics that Fit the Job

DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

2002 Walck Road, North Tonawanda, N. Y.

HOOKER
CHEMICALS
PLASTICS

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to December 26, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the January 15 issue, page 188, of **AUTOMOTIVE INDUSTRIES**, the following additional certificates were announced by the Office of Defense Mobilization, covering December 27 to January 23, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

ACF INDUSTRIES, INC., Berwick, Pa.
Army ordnance material—\$750,000 (40)

ALL AMERICAN ENGINEERING CO., Wilmington, Del.
Military aircraft parts—\$69,732 (70)

ANDERSON, INC., Chicago, Ill.
Military aircraft parts—\$37,326 (70)

ATLANTIC MACHINE TOOL WORKS, INC., Newington, Conn.
Military aircraft engine parts—\$812,307 (70)

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Aircraft Div., Hagerstown, Md.
Military aircraft—\$369,643 (65)

FAIRCHILD ENGINE & AIRPLANE CORP., Fairchild Guided Missile Div., Wyandanch, L. I., New York
Military aircraft—\$42,053 (65)

FAIRCHILD ENGINE AND AIRPLANE CORP., Stratos Div., Bay Shore, Long Island, New York
Military aircraft—\$67,435 (65)

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Military aircraft—\$15,198,200 (60)

MERZ ENGINEERING, INC., Indianapolis, Ind.
Military jet engine components—\$75,042 (70)

NORTHROP AIRCRAFT, INC., Anaheim, Calif.
Military aircraft equipment—\$82,995 (65)

NORTHROP AIRCRAFT, INC., Hawthorne, Calif.
Military aircraft—\$98,195 (65)

THOMPSON PRODUCTS, INC., Harrisburg, Pa.
Military jet engine components—\$792,514 (65)

UNITED AIRCRAFT CORP., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Military aircraft engines—\$2,800,000 (60)

UNITED AIRCRAFT PRODUCTS, INC., Dayton, Ohio
Military aircraft components—\$101,393 (70)

U. S. STEEL CORP., Consolidated Western Steel Div., Maywood, Calif.
Military ordnance parts—\$470,000 (50)

ZARKIN MACHINE CO., INC., Long Island City, New York
Aircraft parts—\$64,705 (70)



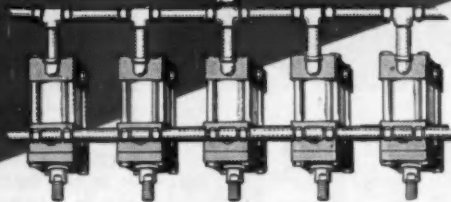
FLUID PRESSURE BOOSTERS

**BOOST
80 PSI AIR**

Input Range: 40 to
3000 psi Air or Fluid

**TO
2000 PSI
HYDRAULIC
PRESSURE**

Output Range: 200 to
10,000 psi Fluid



FULL DETAILS IN MILLER BULLETIN B-200 SENT FREE ON REQUEST
Other Miller products include: Air cylinders, 1½" to 20" Bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

- Save space, weight and investment cost by replacing pump installations in many applications.
- Less costly to install, operate and maintain.
- **Hold Pressure indefinitely** without the motion and heat generation of ordinary pump circuits.
- Provide—at point of cylinder thrust—more efficient power with less weight in less space than direct driven air cylinders.
- Save up to 95% of air consumed by direct driven air cylinders.
- Operates at speeds of 30 to 450 strokes per minute.

NOTE: In addition to its most complete line of "Custom-Built" Boosters available on normal delivery Miller offers 5" bore, 25 to 1 ratio, boosters for immediate delivery in either 6" or 12" stroke. Write for data and prices.

ESPECIALLY RECOMMENDED FOR

- **WELDING**
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and similar applications

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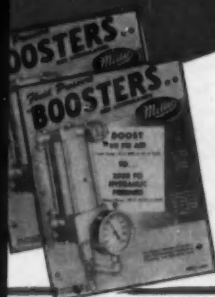
CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS



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ELIOT-BRODY CORP.

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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS



News of the MACHINERY INDUSTRIES

(Continued from page 79)

for producing a vacuum in the furnace. One, the mechanical pump, is probably the oldest type and is nothing more than a compressor operating against atmosphere pressure. Another version of mechanical pump, the Roots design, has a higher speed than the first type but cannot operate at the higher fore pressures. Another method

would be to use a steam ejector system. The most widespread pump used for high vacuum is the mercury or oil diffusion pump which will operate only with a fore pressure of 1/1000 of an atmosphere or less. It, therefore, has to be used in series with a mechanical type of pump. For the aircraft wing furnace, a vacuum of about 50 microns would be required for brazing the 17-7 stainless steel parts. A vacuum furnace, whether in use or not, should always be kept under some degree of vacuum to prevent air and moisture contamination. Leaks should be sought out before each use. If a

leak becomes a problem, it can be checked out with a helium probe or by flooding the chamber with argon and checking with a spectrometer. The pressure rise should be on the order of not more than 25 microns per hour.

Vacuum Arc Furnaces

Vacuum arc melting is a new melting process which is spreading extremely rapidly. It was introduced first into the United States with the melting of titanium, which is still the largest use to date. Vacuum arc melting furnaces are basically of two types. One type is called a nonconsumable arc melting furnace. Melt material is fed continuously into the arc through a vibrating type feeder. The arc is struck between the electrode and the material being dropped into the ingot mold. As the material melts, it strikes the wall of the water-cooled copper crucible and freezes. In the second type, called a consumable electrode arc melting furnace, the material to be melted is actually the electrode. In this type of furnace, all the power is generated to change one electrode into a larger ingot of the same shape, and purify it during the process.

Some of these furnaces require great flexibility. For example, a typical furnace for uranium would have a combination of both consumable and nonconsumable electrodes. In general, the control panels will be remote because of the danger of explosion associated with this type. An explosion might occur if the arc from the electrode leaves the ingot, strikes the water-cooled copper wall and water comes into the furnace to react with the molten material. Proper control of the arc makes this danger negligible.

In addition to removing gases from the molten metal, vacuum arc furnaces have another advantage, the very rapid freezing of the molten material preventing the metallurgical phenomenon known as segregation in which various constituents separate within the ingot. One of the problems being very seriously investigated is the vacuum arc melting of ingots for large forgings used for rotating equipment. It is felt that controlling the cooling rate in a vacuum arc melting furnace of the type described here can solve the problems which have been blamed for the failure of some large generators.

From the electrical standpoint, a vacuum arc melting furnace is quite simple and is nothing more than a d-c arc. Power is obtained from standard welding rectifiers connected in parallel and producing heavy currents up to 30,000 amp. The normal voltage of the arc under vacuum varies between 20 and 40 v.



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NEW THREE LEVER DESIGN
LIGHTER WEIGHT—SHALLOWER
SMOOTHER, QUIETER OPERATION
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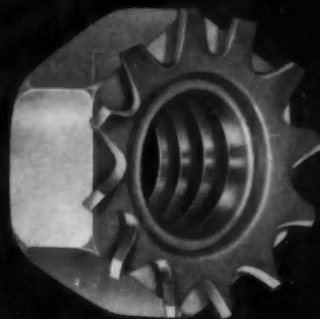
handle

One Unit

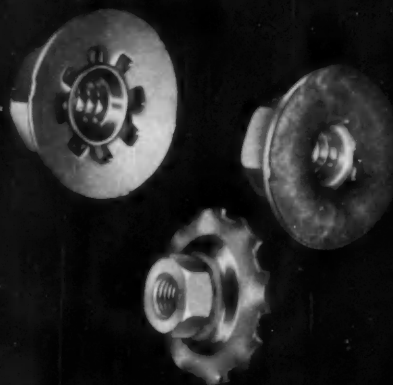
instead of

Two or More

cut costs instantly!



KEPS® pre-assembled nut and
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Each of these Keps replaces three separate units for greater savings: Dished and Domed Washer Keps for extra strength and holespanning; Sealing Keps for sealing out water, oil, gasoline or air.

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Write for Sample Kit Containing Variety of Keps

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NO REASON WHY YOU CAN'T DO IT, TOO!



Typical of the Mueller Climatrol line is this summer air conditioner and gas-fired winter air conditioner, now uniformly painted electrostatically with RANSBURG NO. 2 PROCESS

MUELLER CLIMATROL, Milwaukee, increases paint mileage **40%** with **RANSBURG NO. 2 PROCESS**



And, 10 men averaging
40 hours a week
now do the work
formerly handled
by 24 men
averaging
50 hours!

Painting used to be a bottleneck in the manufacture of heating and air conditioning equipment at Mueller Climatrol.

But not any more!

When Mueller modernized its finishing department—replacing hand spray with Ransburg No. 2 Process Electro-Spray—daily production was increased . . . finishing costs were cut . . . and quality of the work was improved.

Annually, Mueller coats over 10 million square feet of sheet metal, so a 40% increase in paint mileage—translated into paint dollars saved—is a sizeable figure. Pointing up other savings, a typical run of 400 furnace casings used to take 200 man hours to clean and hand spray. Mueller does it now in 60 hours!

NO REASON WHY YOU CAN'T DO IT, TOO!

Whatever your product, if your production justifies conveyorized painting, chances are one of the Ransburg Electro-Coating Processes can do it better, for less, with improved uniformity and quality of the work. Write for our new brochure which includes numerous examples of both large and small manufacturers of a variety of products who are enjoying the many advantages of Ransburg Electrostatic Spray Painting.

Ransburg

ELECTRO-COATING CORP.

Indianapolis 7, Indiana

RANSBURG

Special Fasteners Can Cut Costs

(Continued from page 49)


is required to be in alignment with an octagon head near the other to within half a degree, so that the door lock handle will always be in the correct position. Overall length of the finished piece is 1.43 in. The octagon head is started by cold heading to a round, and the smaller-diameter section at the other end is extruded to size. The spline is then rolled in, and the round head is trimmed to octagonal form at the same time to insure alignment. Pointing and shaving complete the forming operations.

An adjusting screw for brake shoes on trucks makes use of the same eccentric principle as the bumper alignment bolt, and like that part, it is cold-forged in one piece. Another item, not a fastener but produced by cold forming methods, is the tractor transmission gear blank. The length of 1-in. steel rod that is the raw material for the piece is first upset to produce the gear blank diameter of 1 $\frac{1}{2}$ in. The short end of the shaft is then cold reduced to $\frac{3}{4}$ in. in diameter, and the long end is tapered. Cutting the teeth and fluting the taper length on the shaft complete the fabrication. Overall length of the piece is 4 $\frac{3}{4}$ in.

An important part of the suspension in a leading passenger car is a ball stud, made of an alloy steel. Formerly cut from bar stock, the item is now produced by cold heading and cold extruding of wire, fed from 500-lb coils. Substitution of cold forging methods for machining permits the retention of the grain flow pattern developed in processing. This results in hardened metal at the surface of the piece, better strength, a saving of material, and higher production.

Hinge pins for safety belts are made from aluminum or alloy steel. The piece has a collar beneath the head, and the pin body is slotted.

A shoulder screw for the automatic transmission is made of a Grade 3 medium carbon steel, produced to close tolerances. The shoulder diameter itself is critical, and is held to within 0.003 in. A double extrusion process forms the body of the screw and the head and shoulder simultaneously. Savings in production time and in material formerly cut away in machining make this specialty piece economical.



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flatware of

Superior Stainless

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From the kitchen, to the finest tables in the land! That's the progress of modern stainless flatware—thanks to new-day design and finish. • Superior Stainless Strip Steel is chosen widely for flatware applications because of its *superior uniformity and fabricating ease*. From our bright coils come stainless pieces practical for the hardest service, handsome enough for Sunday best!

Superior Steel

CORPORATION

CARNEGIE, PENNSYLVANIA



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Beneficial additives stay in as HD and heat-resistant lube oils pass through the Micronic® element of a Purolator filter... even though the element is straining out sludge, water and impurities as small as one micron (.000039-inch).

It's one of the reasons why original equipment manufacturers in the automotive field use more Purolators than any other make of filter. Besides this "selective" filtration, the accordion-pleated Micronic element provides ten times the area of older types, making possible:

- *High flow rates with minimum pressure drop.* Purolators themselves can be small... yet operate with pumps of standard size.
- *Maximum dirt storage capacity...* for long, efficient service life before replacement.

Micronic elements do not channel. They are waterproof and warp-proof and remain unaffected by engine temperatures. There's a Purolator to fit every vehicle, tractor and other gasoline- or diesel-engine-powered unit in service today. Write for our automotive catalog, No. 2054, to Purolator Products, Inc., Rahway, N. J., Dept. A5-216.

Filtration For Every Known Fluid

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PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

This Month's **GEAR PIX**

SPLINE ROLLING IN ONLY 5 SECONDS...

... That's all it takes to roll-form this helical spline with the Michigan Roto-Flo "chipless production" process. Floor-to-floor time, with automatic loading, is 17 seconds. Cold metal displacement produces required dimensions from blank diameters less than the PD and OD. As accurate as machining, the process produces superior surface finishes. Want more data? Just ask for our application Bulletin RF-55.

GEARS FOR ROADBUILDING EQUIPMENT...

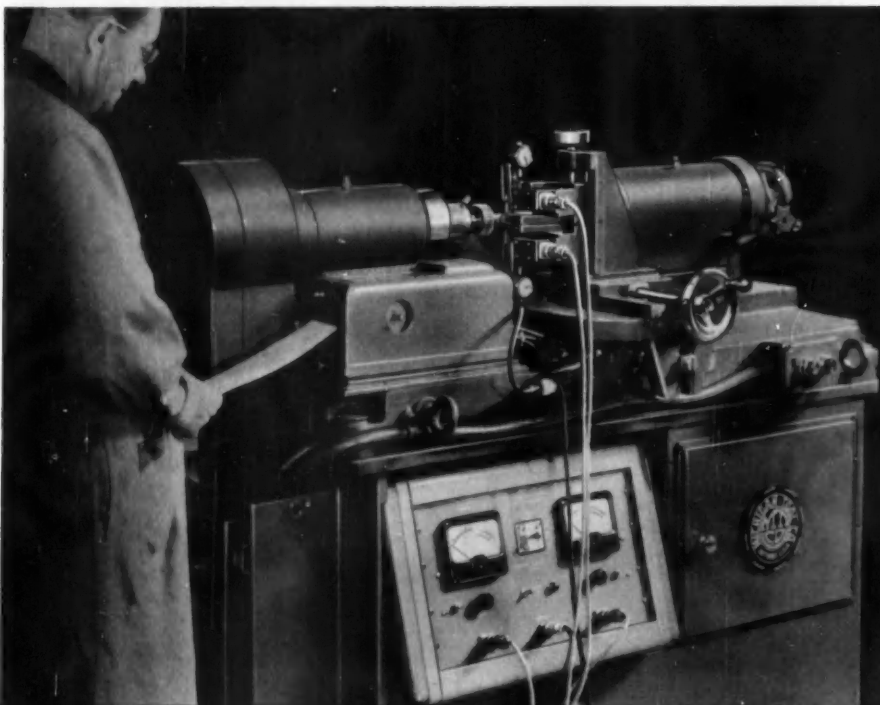
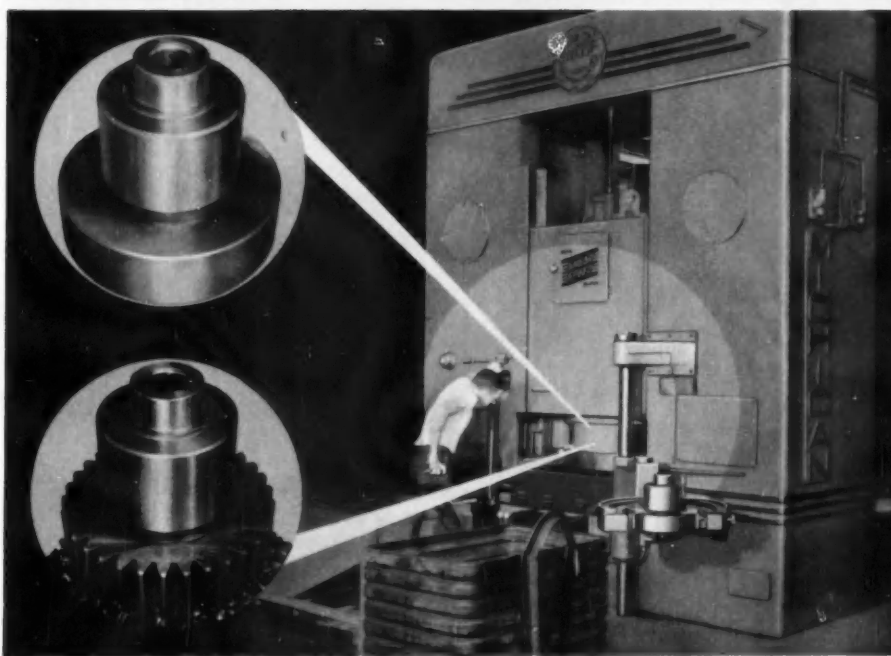
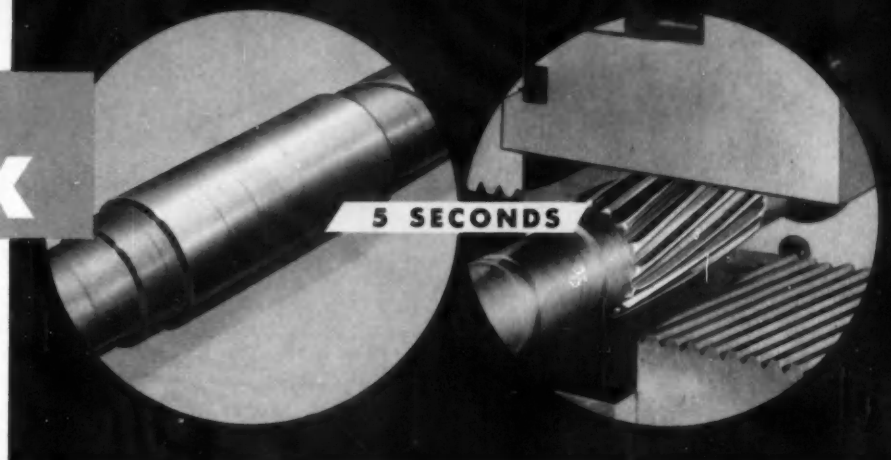
... are readily cut on this automatically cycled Michigan Shear-Speed. The heavy 33-tooth gear shown ($3\frac{3}{4}$ -in. face width) is produced at $5\frac{1}{2}$ pieces per hour, removing over 10 lbs. of SAE 8622 steel as chips. Cutting speed is 17 fpm. Let us send you Bulletin SS-55 telling the full story of large gear shaping.

AUTOMATIC CHECKER FOR HIGH PRECISION GEARS...

... designed particularly for aircraft and special-purpose spur gears. Cuts time needed for checking and recording parallelism, tooth taper and tooth spacing to 16% of normal. Handles gears from $\frac{1}{4}$ to $2\frac{1}{2}$ -inch face width and up to 14 inches diameter. Readings are automatically and permanently recorded by a built-in recorder for easy comparison. Ask for Bulletin 481-A.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.



This Month's **GEAR PIX**

AUTOMATIC LOADING UPS GEAR SHAVING OUTPUT . . .

. . . and releases the operator for preliminary gear checking. Mechanical loaders on standard machine tools (shown here: a Michigan Gear Shaver) offer a middle ground of automation that pays off immediately in output per machine-hour without increasing the work load of the operator. It's also safer.

READY SOON— A TANDEM HOBBER . . .

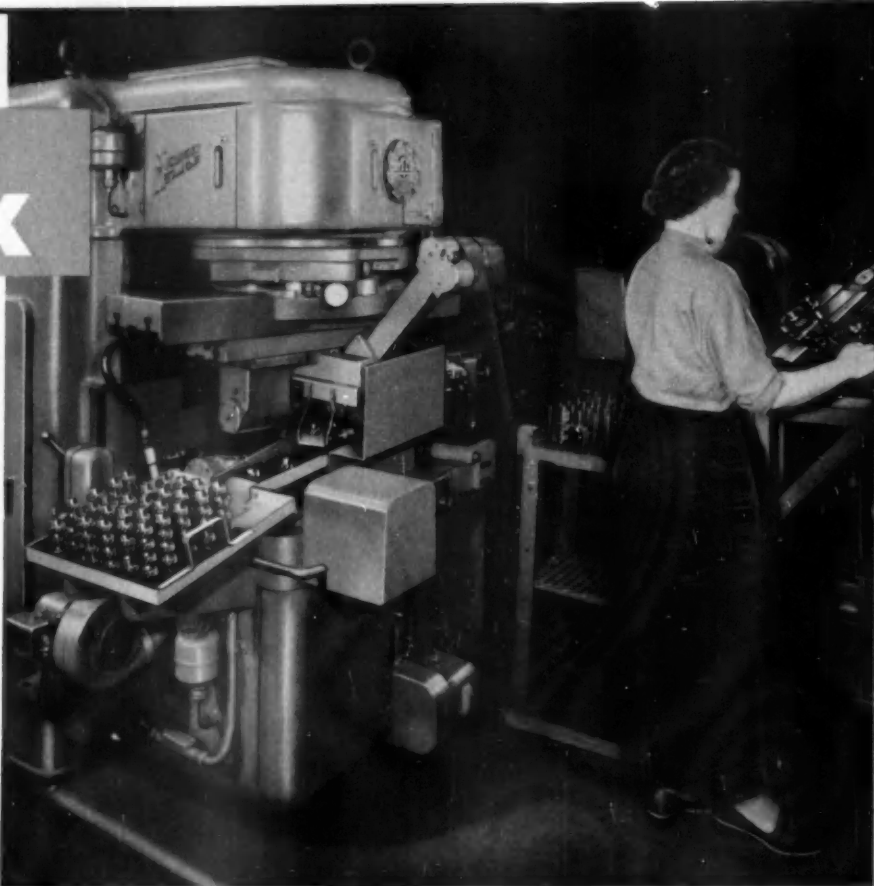
. . . latest addition to the Michigan line of hobbers features self-contained checker, automatic size control, loading and unloading, and chip disposal. You'll be able to set two or more of these hobbers in series for continuous through-feeding of parts. Literature coming off press soon—drop us a line now.

FROM RESEARCH— BETTER MACHINES, BETTER GEARS . . .

. . . Michigan machines and tools of tomorrow—for the controlled-quality, easier-made gears and splines to come—will owe much to the work of our research staff. This stepped-up development activity, now housed in new facilities (one section of which is shown), will carry on the scientific study basic to gear progress. New methods, machines and tools are sometimes the best answer to requirements of a particular manufacturer. If you have a problem in the area of gear and spline production, we will be glad to talk it over.

MICHIGAN TOOL COMPANY

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1957 ROAD SHOW

(Continued from page 65)

intended for light work, or for work under adverse conditions where heavier equipment cannot operate. Eimco Corp. announced a front-end loader with simplicity of controls as a feature. General Motors Truck and Coach Div. displayed new GMC turbo-charged Diesels that included a power take-off so that a concrete mixer mounted on a truck could be driven by the truck's power plant.

Wooldridge Mfg. Div. of Continental Copper and Steel Industries, Inc., had several new pieces of equipment, including a 10-yd self-propelled scraper, and a towed scraper of 39 yd capacity. Hyster Co. displayed some of its attachments for the Caterpillar tractors.

The Tractor Group of Allis-Chalmers Mfg. Co., with a large display, showed a wide range of construction equipment. Much of it utilizes torque converters for ease of operation. A motor grader, a motor scraper, and several tractors in the 204 hp range offered versatility in service as an important consideration.

Ford Motor Co. had several Tilt Cab Trucks at the show, with a short-

er truck wheelbase and increased permissible trailer length. Huber-Warco showed its new three-wheel rollers for compaction of bituminous mixtures, along with other earthmoving machinery.

J. I. Case showed several of its tractors with earthmoving attachments. Austin-Western Works of Baldwin-Lima-Hamilton Corp. displayed a wide variety of moving and finishing equipment. Barber-Greene Co. showed representatives of its line of batchers, mixers, and pavers. Blaw-Knox Co.'s Construction Equipment Div. displayed a recently developed dual drum trench roller, and a 4-cu yd hydraulic concrete bucket equipped with self-contained power for opening its discharge gates. Euclid Div. of General Motors showed some of its high-capacity equipment, including motor scrapers and off-highway vehicles. Deere & Co. displayed a variety of tractor attachments. Gar Wood Industries, Inc., had some of its large dump bodies and other equipment in its exhibit. LeTourneau-Westinghouse Co. showed some of its line of motor graders, tractors, scrapers, etc. Koehring Co. had several of its cranes and shovels in the show. Oliver Corp. showed some of its tractors and accessories. Warner & Swasey Co.'s line of Gradall motor graders was well represented.

Marman Clamps, Straps, Couplings,

SIMPLIFY FASTENING AND JOINING PROBLEMS

If you are concerned with assembly of components, connection of tubing and ducting, or support of ducts and accessories, Marman Products can help solve design problems. Marman offers a wide range of clamps, straps and couplings in standard sizes or to your specifications. Write today for full catalog information, or engineering assistance.



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Flexible Couplings



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BE SURE
Say "Southern"!**

At Southern Screw, the standard or "special" you want right now may be in our stock of over a billion fasteners. Chances are we can fill your order and have it in transit in a matter of minutes!

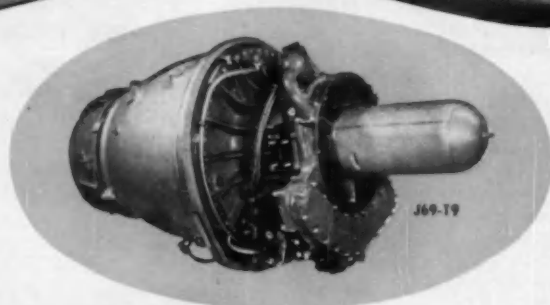
If you're looking for fasteners of quality, and want service you can depend on time after time—give that order you're holding to Southern. We make a living, living up to our claims! Try us . . .

Write us your requirements, or wire us and you'll receive an answer "on the double." Ask for our Stock List, free samples, and Regional Warehouse Stock Guide. Address P.O. Box 1360—Al, Statesville, North Carolina.

Wood Screws • Machine Screws & Nuts • Tapping Screws • Wood & Type U Drive Screws • Stove Bolts • Dowel Screws • Hanger Bolts • Carriage Bolts



TEMCO TT-1



LATEST DEFENSE ASSIGNMENT for CAE TURBINE POWER

Performance and ease of control join hands with a high degree of safety in Temco's TT-1 primary jet trainer, which the Navy has ordered into production after exhaustive tests. This modern tandem two-seater is designed to condition the student's reflexes to the piloting of jets, from the very start. It is a matter of pride and gratification to CAE that this newest addition to our country's military training equipment flies with Continental J69-T-9 gas turbine power.



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SUBSIDIARY OF CONTINENTAL MOTORS CORPORATION



Commerce Dept. reports that in the postwar years 1947 to 1956, inclusive, business spent over \$250 billion on new plant and equipment. For 1956, businessmen reported that they expected to spend \$35 billion for capital outlays. Preliminary results show that actual outlays in 1956 were virtually the same as forecast by business.

Air Force will weight its plane purchases heavily in favor of big bombers and high-performance fighters. In the fiscal year beginning July 1, the service will buy some 1515 planes, nearly all of them in these two categories.

Automobile manufacturers see a chance for \$30 million a year in savings through excise tax law changes. They've asked Congress for and received some support on amendments to the rules.

Data on the demand for and supplies of hard-to-get materials used by industry are to be made more accurate. Commerce Dept. wants to start an efficient accounting system covering them.

Outlays for running and servicing Government cars, trucks and buses rose to \$129.2 million in 1956, compared to \$127.9 million in 1955. Expenses figure out at 7½¢ per mile per unit in 1956. While total costs were rising, the Government was cutting its vehicle ownership. It had 195,548 units at the end of the last complete business year, as against more than 211,000 a year earlier.

Congress is preparing to take a close look at the nation's progress in putting the atom to work industrially. Industrial applications of atomic energy are not proceeding at the expected pace.

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AN AUTOMOBILE requires a durable paint finish that retains its beauty under all weather conditions—ice and snow, sun and rain. ACP Granodine phosphate coating provides an excellent base for such a finish—greatly increases the adhesion of the paint to the metal.

ACP Granodine provides an excellent base for sparkling, durable paint finishes on automotive equipment, home appliances and industrial products by chemically converting steel surfaces to a nonmetallic phosphate coating. It not only greatly increases the adhesion of the finish, but also provides extremely good corrosion resistance even when used in conjunction with a relatively thin and flexible paint film. Granodine coatings are easily and economically applied to steel surfaces by dipping, spraying or brushing.



IN THE HOME, ranges, refrigerators, freezers, washers and dryers are among the many products whose sparkling finish is anchored to the metal by Granodine coating.



IN INDUSTRY, drums, materials handling equipment, machine tools and many other steel products used throughout the plant are protected by a Granodine base.

LEARN ALL ABOUT ACP GRANODINE. Bulletin 1380 describes the various types of ACP Granodine and gives information which will help you select the proper type for your particular application. Write for your copy today.



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• ST. JOSEPH, MO.

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New Chemical Horizons for Industry and Agriculture

More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from December 27, 1956 to January 29, 1957. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AEROQUIP CORP., Jackson, Mich.
Hose assembly—4100 ea.—\$109,224
AEROQUIP CORP., Van Wert, Ohio
Hose, rubber, 3/4 ft. hose fittings—3216 ea.—\$28,730
AMERICAN LA FRANCE CORP., Elmira, New York
Spare parts—730 ea.—\$83,380
AMERICAN MOTORS CORP., Washington, D. C.
Station wagons—9 ea.—\$14,358
AMERICAN MOTORS CORP., Special Products Div., Detroit, Mich.
Cupola, commander's machine gun, caliber .50, M13—1391 ea.—\$2,987,046

AVIATION CORP., Farmingdale, Long Island, New York
Spare parts for F84 A/C; various quantities—\$274,080

THE B. G. CORP., Ridgefield, New Jersey
Thermocouples, spark igniters—Various—\$100,018
Plug—20,000 ea.—\$33,000

BAKER-RAULANG COMPANY, Cleveland, Ohio
Truck, crane, whse., electric, 10,000 lb capacity—5 ea.—\$73,415

THE BARDEN CORP., Danbury, Conn.
Bearings—195,000 ea.—\$224,253

BEECH AIRCRAFT CORP., Wichita, Kansas
MD-3 generator sets—\$486,473

BELL AIRCRAFT CORP., Buffalo, New York
Facilities to support GAM-63 reliability program—\$405,000

BELL AIRCRAFT CORP., Fort Worth, Texas
Helicopters, Model HTL-7—\$1,996,918

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Wheel and brake assemblies, B-52D aircraft—\$3,370,054

BENDIX AVIATOR CORP., Bendix Skinner Div., Royal Oak, Mich.
Element and filter assys.—Various—\$92,788

BENDIX AVIATION CORP., Utica Div., Utica, New York
Maintenance parts to support eclipse starters—Various—\$64,467

BOEING AIRPLANE COMPANY, Industrial Products Div., Seattle, Wash.
Spare parts—1503 ea.—\$59,874

BORG-WARNER CORP., Pesco Products Div., Bedford, Ohio
Services and parts for pump assys.—\$96,326
Fuel pump assys.—Various—\$191,444

BORG-WARNER CORP., Rockford Clutch Div., Rockford, Ill.
Motor vehicle parts—2130 ea.—\$33,654

CHRYSLER CORP., Detroit Universal Div., Dearborn, Mich.
Automotive spare parts—2529 ea.—\$63,453

CHRYSLER CORP., Washington, D. C.
Trucks—123 ea.—\$247,677

CLARK EQUIPMENT CO., Buchanan, Michigan
Forklift trucks—7 ea.—\$26,300
Tractors, wheeled warehouse, gasoline, 2600 lbs draw bar pull—33 ea.—\$76,296

CONSOLIDATED DIESEL ELECTRIC CORP., Stamford, Conn.
Spark plug—425 ea.—\$40,835

CONTINENTAL AVIATION AND ENGINEERING CORP., Detroit, Mich.
Further development testing of AOI-628-1 engine—\$433,635

CONTINENTAL MOTORS CORP., Muskegon, Michigan
Repair and overhaul of packette engines—\$40 ea.—\$508,811
Engines—70 ea.—\$677,362

Engine spare parts—4168 ea.—\$197,506
Four Model AVSI-1790-6 engines—\$71,619

CURTISS-WRIGHT CORP., Propeller Div., Caldwell, New Jersey
Repair and/or modification of four types of electric propeller assemblies—\$4,062,250

Spare parts for C636SP and C736S propellers—\$294,661
Spare parts applicable to propeller assemblies—\$76,286

CURTISS-WRIGHT CORP., Wright Aera Div., Wood-Ridge, New Jersey
Product improvement on J65 turbojet engines—\$1,910,000

(Turn to page 116, please)

QUICK-CONNECTIVE COUPLINGS

For Pneumatic or Hydraulic Line Service

Regardless of whether your particular application requires One-Way Shut-Off, Two-Way Shut-Off, or Straight-Through Couplings—or Couplings for special service on fluid lines carrying oxygen, acetylene, gasoline, steam, etc.—you can always select a Hansen Coupling specifically engineered for your requirements.

As the result of years of experience with fluid line layouts in thousands of plants, each type of Hansen Coupling is carefully designed to incorporate the specific features needed for the job it is intended to do.

The next time you plan to alter or install a fluid line hook-up, make use of the know-how of your nearest Hansen representative. You'll find him a real help in getting exactly the Couplings you need to do the job.

Write for the Hansen Catalog
Here's an always ready reference when you want information on Couplings in a hurry. Lists complete range of sizes and types of Hansen Quick-Connective Couplings. Write for your copy.
Representatives in Principal Cities



ONE-WAY SHUT-OFF



TWO-WAY SHUT-OFF



STRAIGHT-THROUGH COUPLING

QUICK-CONNECTIVE FLUID LINE COUPLINGS

SINCE 1915

THE HANSEN



MANUFACTURING COMPANY

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Leading tank carrier standardizes on Fuller 8-speed ROADRANGER® Transmissions

Fuller 8-speed, semi-automatic ROADRANGER Transmissions will be *standard* in all new tractors purchased by Leaman Transportation Corporation, Leaman Transportation Company, Inc. and Chemical Tank Lines, Inc. of Downingtown, Pennsylvania.

The combination of these three companies comprises one of the largest tank carrier operations in the world. Since 1930 this organization has used hundreds of Fuller Transmissions . . . and recently added 36 new R-46 ROADRANGERS in new

White and International Tractors as part of the standardization on this 8-speed model.

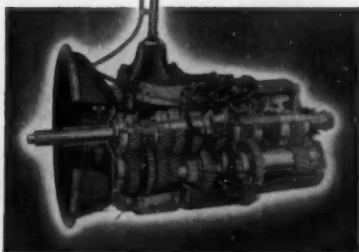
Says D. A. (Dave) Ross, Vice President: "We get the best service from the 8-speed ROADRANGERS in our operation. Some have over 150,000 miles on them, and have not been touched. Our maintenance cost is much less . . . in fact, we haven't had any cost to date since we have had *no* trouble.

"50% of all our mileage on the petroleum hauls is with an empty trailer. With the .577 ratio in the rear axle and 10 x 22 tires, we can maintain a good road speed empty in 8th

gear . . . at approximately 2000 to 2200 rpm with our gas engines. This results in better fuel mileage and better engine life. And, we are able to maintain a higher rpm at all times under a load. Our drivers now say they wouldn't have any other transmission."

For efficient, dependable operation of your trucks, ask your truck dealer now for full details on the easiest-shifting transmission available for your operation. Specify Fuller ROADRANGER Transmissions for faster trip time, lower fuel consumption, longer engine life, less driver fatigue and greater profits.

Fuller R-46
ROADRANGER Semi-Automatic
Transmission



FULLER MANUFACTURING COMPANY
Transmission Division, Kalamazoo, Michigan

Unit Drop Forge Division, Milwaukee 1, Wisconsin • Shuler Axle Company, Louisville, Kentucky (Subsidiary) • Sales & Service, All Products, Western District Branch, Oakland 6, California and Southwest District Office, Tulsa 3, Oklahoma.



New I-R Torque Control Impacttools prove value on auto assembly line

A leading auto manufacturer reports greatly improved *product quality* on 3 auto and truck assembly line operations where Ingersoll-Rand Torsion Bar Torque Control Impacttools have been used for 6 months.

A safety hazard is eliminated on one operation, where these new Impacttools have made torque control possible for the first time. The photo above shows the I-R Size 5040T Torque Control Impacttool securing the steering gear assembly to the truck frame.

Other major benefits include time saving, because these Impacttools operate at full power and speed until they automatically shut off when pre-set torque is reached... and elimination of the need for hand torquing on many nut running jobs.



Size 5040T 2 Torsion bars available with max. torques of 60 and 90 ft. lbs.

Write for the complete story on this latest I-R development!

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

8-346

(Continued from page 114)

CURTISS-WRIGHT CORP., Metals Processing Div., Buffalo, New York
Facilities for production of blades for J-65 engines—\$144,000

D-J INDUSTRIES, INC., Clearfield, Pa.
Muffler, exhaust with bracket assy.—11,213 ea.—\$84,097

ELASTIC STOP NUT CORP. OF AMERICA, Union, New Jersey
Nut elastic—38,450 ea.—\$88,169

THE ELECTRIC AUTO-LITE COMPANY, Toledo, Ohio
Battery, 12 volt—2000 ea.—\$43,240

ELECTRIC STORAGE BATTERY CO., Willard Storage Battery Div. Cleveland, Ohio
Battery, 12 volt—14,156 ea.—\$302,089

THE FAFNIR BEARING COMPANY, New Britain, Conn.
Bearings—45,170 ea.—\$899,380

FEDERAL-MOGUL-BOWER BEARINGS, INC., Detroit, Mich.
Bearing set, engine crankshaft—21,330 ea.—\$35,407

FEDERAL MOTOR TRUCK CO., Div. Napco Industries, Inc., Detroit, Mich.
Automotive spare parts—521 ea.—\$65,740

THE FIRESTONE TIRE AND RUBBER CO., Guided Missile Div., Los Angeles, Calif.
Design, manufacture, stowage and launching system for guided missile—\$1,756,846

FORD MOTOR CO., Ford Div., Washington, D. C.
Trucks—265 ea.—\$367,250
Automobiles—80 ea.—\$122,151
Truck, stake and platform, 2 ton—250 ea.—\$564,448

FORD MOTOR COMPANY, Dearborn, Michigan
Care and custody of production facilities and other items for tank, 90mm, T48—\$157,200
Ford Model 368-UC, 8 cyl V-8 engines—\$215,000

THE GEAR GRINDING MACHINE CO., Detroit, Mich.
Automotive spare parts—590 ea.—\$31,064

GENERAL ELECTRIC CO., Aircraft Gas Turbine Div., Cincinnati, Ohio
Special tools and equipment for J-47 engines—76 ea.—\$229,738

GENERAL MOTORS CORP., AC Spark Plug Div., Flint, Mich.
Gage, fuel, assy.—24,120 ea.—\$63,918

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.
J71-A-2 engines for F3H A/C—\$20,202,750
Research and development in connection with XT-90-2 transmissions—\$702,170
Modify and convert J33-A-33/33A and J33-A-41 turbojet engines—\$1,427,520

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Truck, maintenance, 1½ ton, 4x2—11 ea.—\$46,982
Trucks—426 ea.—\$638,204
Automobiles—212 ea.—\$293,934
Truck, pickup, ½ ton—3234 ea.—\$3,974,555

Truck, panel, 1 ton, 67 ea.; truck, cargo, 1 ton, 50 ea.; truck, multi-stop, 1 ton, 40 ea.; truck, cargo, ¾ ton, 2 ea.—\$306,009

GENERAL MOTORS CORP., Foreign Dist. Div., New York, N. Y.
Trucks—10 ea.—\$16,925

GENERAL MOTORS CORP., GMC Truck & Coach Div., Pontiac, Mich.
Automotive spare parts—32,320 ea.—\$116,401
Bus, B.O.C., 27 passenger—121 ea.—\$628,038

GENERAL MOTORS CORP., New Departure Div., Bristol, Conn.
Bearings—93,530 ea.—\$106,586

GENERAL MOTORS CORP., United Motors Service Div., Detroit, Mich.
Spark plug—600 ea.—\$32,091
Automotive spare parts—3782 ea.—\$103,365

THE GENERAL TIRE & RUBBER CO., Akron, Ohio
Tire, 7.50 x 20, 8 ply—16,452 ea.—\$376,750

GILL ELECTRIC MANUFACTURING CORP., Relands, Calif.
Batteries—4577 ea.—\$239,560

THE GOODYEAR TIRE AND RUBBER CO., INC., Akron, Ohio
Wheel assemblies for F-105B, C, A, and RF-105A aircraft—\$49,518
Wheel and brake assys.—Various—\$166,252
Maintenance parts for brake assy.—Various—\$283,500
Brake assys.—246 ea.—\$48,127
Maintenance parts for F9F-ST aircraft—Various—\$314,703
Tire, 9.00 x 16, 8 PR—17,940 ea.—\$652,483
Main wheel assys. and main brake assys. for H-21C helicopters—\$31,475
Wheel assys.—Various—\$44,855

GOULD-NATIONAL BATTERIES, INC., Depew, New York
Batteries—4577 ea.—\$233,218

THE HEIM COMPANY, Fairfield, Conn.
Bearings—60,075 ea.—\$69,213

HEINTZ MANUFACTURING, Philadelphia, Pa.
Facilities for production of engine components—\$725,000

HOLLEY CARBURETOR COMPANY, Van Dyke, Michigan
Automotive spare parts—8180 ea.—\$27,485

INTERNATIONAL HARVESTER CO., Washington, D. C.
Bus, B.O.C., 37 passenger—17 ea.—\$96,872
Truck—1 ea.—\$10,904
Truck, panel, step-in-drive, 1 ton—459 ea.—\$900,558

KING ELECTRIC EQUIPMENT CO., Cleveland, Ohio
Motor vehicle parts—355 ea.—\$43,008

LEAR, INC., Grand Rapids, Mich.
Maintenance parts for aircraft—Various—\$118,308

LEONARD SPARK PLUG CO., INC., Newark, New Jersey
Spark plugs—75,000 ea.—\$38,550

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
RF-104A aircraft—\$6,300,000

LOCKHEED AIRCRAFT SERVICE, INC., Ontario, Calif.
IRAN and technical order modification of F94 A/B/C aircraft—276 ea.—\$4,822,061

MCDONNELL AIRCRAFT CORP., St. Louis, Mo.
Windshield assys.—\$209,004
Spare parts for F2H aircraft—Various—\$62,498

MARLIN-ROCKWELL CORP., Jamestown, New York
Bearings—16,650 ea.—\$116,590

THE GLENN L. MARTIN COMPANY, Baltimore, Maryland
Parts, tooling, data, engineering and components for modification of aircraft—\$3,340,480

THE MOHAWK RUBBER CO., Akron, Ohio
Tire, 9.00 x 16, 8 pr—7797 ea.—\$315,224
Tire, 16.00 x 25, 24 PR—130 ea.—\$47,851

MONROE AUTO EQUIPMENT CO., Monroe, Michigan
Automotive spare parts—71,704 ea.—\$136,238
(Turn to page 118, please)

is there a COST-SAVING idea in this picture for you?



*air-powered screw drivers
end handwork in close quarters*



*Exceptionally small side-to-center distance of this Ingersoll-Rand air-powered screw driver permits running screws that electric tools can't reach and that formerly had to be driven by hand.

AIR engineering at work
REPORT No. 4211.05

The men pictured above are saving \$1.35 on a single unit. That's a saving of \$87.75 a day for their company. Production has increased 160% since the two men changed from a combination of

electric tools and hand methods to I-R Air-Powered Screw Drivers. At this rate, the I-R tools paid for themselves in 3 1/4 days!

Can you picture a similar saving in your plant? An I-R AIRengineer, with over 1000 sizes and types of air and electric tools to work with, will gladly analyze your assembly operation and make recommendations without obligation. Write today!

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

8-507

(Continued from page 117)

PACIFIC TIRE & RUBBER CO., Oakland, Calif.
Tire, 6.00 x 16—\$944 ea.—\$108,490

REO MOTORS, INC., Lansing, Michigan
Parts—714,520 ea.—\$33,423

THE ROVER COMPANY, LTD., Birmingham, England
Trucks—10 ea.—\$17,692

SILENT HOIST & CRANE COMPANY, Brooklyn, New York
Truck, forklift, 15,000 lb—4 ea.—\$33,722

SOLAR AIRCRAFT CO., San Diego, Calif.
Gas turbine generator sets—180 ea.—\$1,777,500

SOUTHERN COACH MANUFACTURING CO., INC., Evergreen, Ala.
Trailer, semi, personnel, 7 ton, 70-80 passenger, 2 wheel, 28 ft—17 ea.—\$75,398

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Starters, pneumatic, aircraft engine—\$496,000

UNITED AIRCRAFT CORP., Sikorsky Aircraft Div., Stratford, Conn.
Iran maintenance of H-19 type aircraft—48 ea.—\$472,800

WAGNER ELECTRIC CORP., St. Louis, Mo.
Cylinder, wheel assy.—6976 ea.—\$41,873

WARD LAFRANCE TRUCK CORP., Elmira, New York
Fire truck—1 ea.—\$20,271

WATSON AUTOMOTIVE EQUIPMENT CO., Washington, D. C.
Automobile, ambulance, ¾ ton, 4x2, 4 litter—48 ea.—\$221,582

WILLYS MOTORS, INC., Toledo, Ohio
Trucks, jeep—185 ea.—\$305,981
Spare parts for ¼ ton vehicle—\$1,069,268
Engine for truck, ¼ ton—\$440,484

WINSLOW ENGINEERING COMPANY, Oakland, Calif.
Filter element—10,000 ea.—\$28,600

THE ZELLER CORP., Defiance, Ohio
Spark plugs, shielded, 14 mm—\$21,500 ea.—\$171,914

BOOKS...

ESSENTIALS OF MACHINERY PROCUREMENT AND DEVELOPMENT, published by American Management Association, 1515 Broadway, New York 36, N. Y. Price, \$2.50 (AMA members: \$1.75). This report supplies practical solutions to many of the problems involved in purchasing and developing new equipment. Included is a detailed presentation by one company of its program for acquiring capital equipment. Other papers deal with financial and tax considerations, techniques for safeguarding the buyer of equipment, procurement in a multi-plant company, and spending on a limited budget.

ASTM METHODS FOR CHEMICAL ANALYSIS OF METALS, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$8.00. This edition, the first complete revision since 1950, contains all ASTM methods for chemical analysis of ferrous and non-ferrous metals and alloys, including spectro-chemical procedures. Ten completely new methods and recommended procedures are described; these include chemical analyses for electronic nickel and titanium, and two important recommended practices in the field of spectro-chemical analysis. In addition ten standards have been substantially revised. In all the book contains, 42 methods of analysis, five recommended practices, and one specification.

ATOMIC ENERGY FOR YOUR BUSINESS, by A. Kramish and E. M. Zuckert, published by David McKay Co., 53 Fifth Avenue, New York 3, N. Y. Price, \$4.50. This book is designed to help the businessman who wants to know just what atomic energy is, and what it can do for him now and in the future. Here, in laymen's terms, are presented the brief fundamentals of atomic energy—just enough for the proper understanding of this subject and to serve as the basis for further reading. Applications of atomic energy in all phases of industry are examined, as are items of immediate importance to industry as a whole. In addition the authors offer practical advice on how to obtain more specific and detailed information relating to a particular business, and they also evaluate present and potential markets.

ELEMENTS OF GASDYNAMICS, by H. W. Liepmann and A. Roshko, published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price, \$11.00. The basic aim of this volume is to provide a sound physical background for work in modern gasdynamics and high speed aerodynamics. In order to provide a working knowledge of the essentials of gas flow, the authors have limited their discussion of applications to what is necessary for an understanding of theory. The book covers such subjects as thermodynamics, basic equations of motion, fundamentals of high-speed aerodynamics, experimental methods, and viscous flow. The treatment is comprehensive and, in the authors' words, "should give the necessary background for reading original papers on the subject."



We Suggest You Consider The Qualifications of This Motor

Representative of the Lamb Electric Motors now in service driving many types of products, this motor:

First, was designed for the particular job to be done, assuring optimum product performance.

Second, was developed and manufactured by personnel having many years of experience in the small motor field.

Third, was custom manufactured on a volume basis.

For these and other reasons, use of a Lamb Electric Motor usually results in an improved product . . . and lower overall costs. May we demonstrate?

THE LAMB ELECTRIC COMPANY • KENT, OHIO
In Canada: Lamb Electric—Division of Sangamo Company Ltd.—Leaside, Ontario

Lamb Electric

SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS



Rochester Fuels GM's Famous Five

... with America's finest carburetors and
first passenger car Fuel Injector Systems

Rochester produces outstanding "GO"-getters for America's finest cars. Leading the way in the high-compression era with advanced carburetor design, Rochester now introduces a new kind of performance through precision fuel control. It's Rochester's new Fuel Injector Systems... another engineering first from General Motors. These quality fuel systems are engineered and specifically designed to develop new highs in power, smoothness and torque. And they are typical of the constant advances made by Rochester to pave the way for tomorrow's performance today! That's why you'll find Rochester Fuel Controls on the new Cadillac, Buick, Oldsmobile, Pontiac and Chevrolet.

R
OCHESTER
AUTOMOTIVE
FUEL CONTROLS

Rochester Products Division of
General Motors, Rochester, N. Y.

How can aluminum help you style and sell

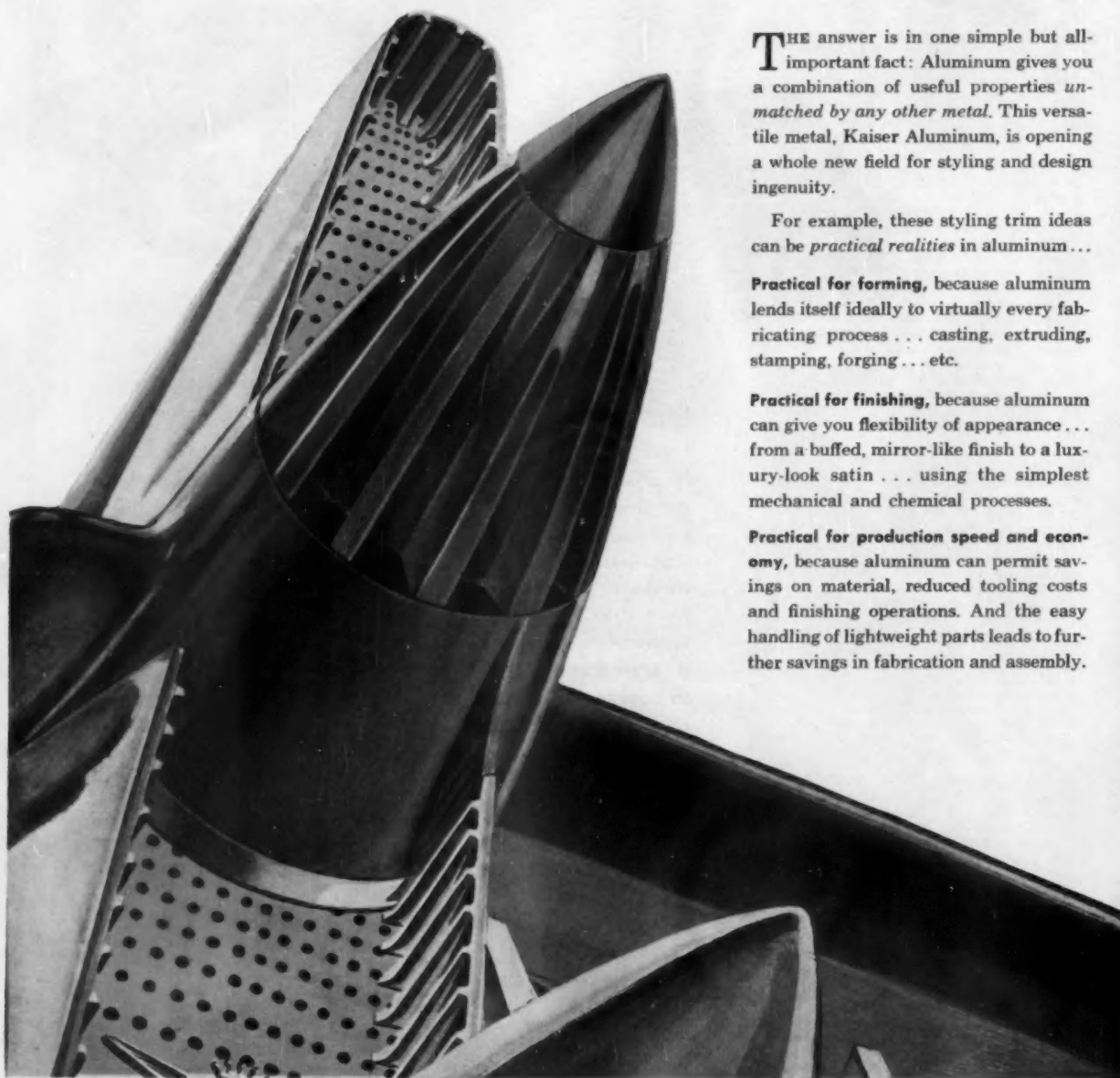
THE answer is in one simple but all-important fact: Aluminum gives you a combination of useful properties *unmatched by any other metal*. This versatile metal, Kaiser Aluminum, is opening a whole new field for styling and design ingenuity.

For example, these styling trim ideas can be *practical realities* in aluminum...

Practical for forming, because aluminum lends itself ideally to virtually every fabricating process... casting, extruding, stamping, forging... etc.

Practical for finishing, because aluminum can give you flexibility of appearance... from a buffed, mirror-like finish to a luxury-look satin... using the simplest mechanical and chemical processes.

Practical for production speed and economy, because aluminum can permit savings on material, reduced tooling costs and finishing operations. And the easy handling of lightweight parts leads to further savings in fabrication and assembly.



tomorrow's car?

And — again through this unique combination of *properties* — aluminum provides extra benefits that can be used as sales advantages...

Lasting beauty, solid aluminum, with no plating to chip, wear or peel.

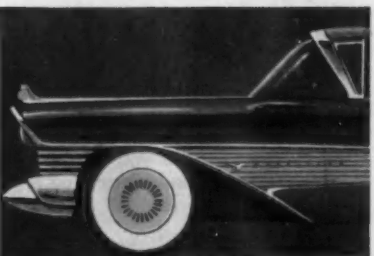
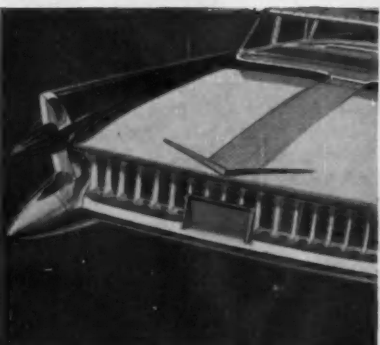
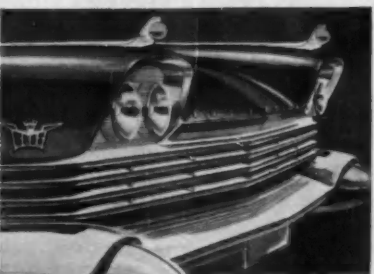
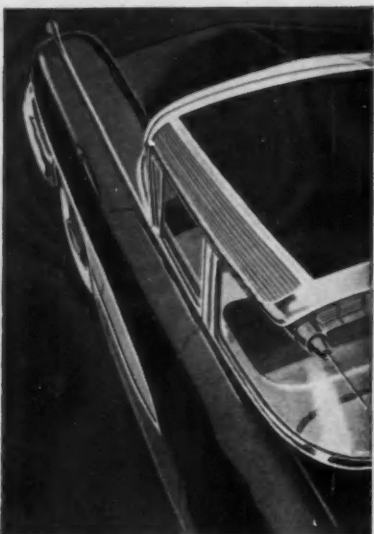
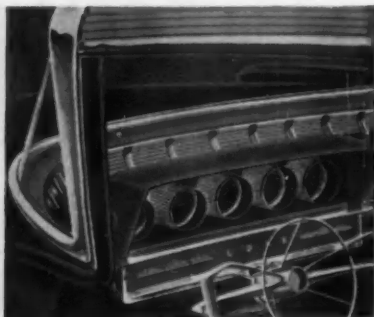
Rust-proof, corrosion resistant.

Easy to maintain, "new look" for the life of the car helps boost trade-in value and lowers reconditioning costs.

Our Automotive Development engineers are available to work with you as "idea partners"... introducing new developments such as Kaiser Aluminum's exclusive, *sunfast* gold-color aluminum alloy... as well as to help you on any specific requirements and problems in aluminum alloy selection and fabrication.

For further information, call our Automotive Industry Division, TRinity 3-8000, Detroit. Kaiser Aluminum & Chemical Sales, Inc., 2214 Fisher Bldg., Detroit 2, Michigan.

See "THE KAISER ALUMINUM HOUR."
Alternate Tuesdays, NBC Network.
Consult your local TV listing.



Kaiser Aluminum

a NEW protective coating
for the
NEW high tensile steels

**Zincilate
410**

Zincilate 410 meets all requirements
of Spec. MIL-P-26915 (USAF)

The tremendous speeds being achieved by modern aircraft have created a whole new set of design engineering problems. New steel alloys, heat treated to secure higher tensile strengths, had to be developed to withstand the heat generated by extremely high speeds, and to resist the shock of high speed landings.

These completely new high tensile steels require a completely new type of protective coating. Being subject to even greater hydrogen embrittlement than ordinary steels when cadmium plated, these new alloys require Zincilate 410, a protective coating that eliminates all traces of hydrogen embrittlement.

Zincilate 410 (one of several Zincilate formulations) provides other outstanding advantages over outmoded protection methods. Zincilate 410 will increase productive output because the controlled time cycle and size limitations of plating are eliminated. Conventional painting equipment is used to spray, dip or brush Zincilate 410, thus no more costly plating equipment. Zincilate 410 can be applied in the field, without dismantling the damaged part for return to the plating plant. And you can apply Zincilate 410 in your own plant, saving more time and money.

If your product is now being cadmium plated, all these advantages can be yours by simply using Zincilate 410. You may be surprised by the first cost, but you'll be amazed by the savings, which are far greater. Why not outline your coating problem now, on your company letterhead please, so we can tell you frankly what Zincilate 410 can do for you?

Zincilate

CORROSION-RESISTANT,
ABRASION-RESISTANT,
WELDABLE, AIR-DRIED and
BAKED PROTECTIVE COATINGS

INDUSTRIAL METAL PROTECTIVES, INC., 403 HOMESTEAD AVE., DAYTON 8, OHIO

SHORTIES

World rubber consumption, now running at about three million long tons per year, may increase to over four million long tons by 1965. World production of natural rubber, now running at about 1.9 million long tons, is not expected to rise above two million long tons annually by 1965.

Better oil refining processes enable today's refinery worker to buy twice as much gasoline with an hour's pay than was possible 20 years ago.

It takes five working Americans to provide for eight others in addition to taking care of their own needs.

It is estimated the cost of metal cutting in the U. S. alone is \$10 billion yearly. Fifty per cent of this staggering figure is wasted in the metal chips machined away.

The number of licensed drivers of motor vehicles in the U. S. now exceeds the total number of the nation's inhabitants at the time the automobile was introduced.

In each Air Force aerial refueling operation, fuel can be transferred at 600 gpm—enough to fill the gas tanks of 38 automobile in 60 seconds.

A new U. S. supersonic research plane, if possessing sufficient fuel, could circle the earth twice at the equator in 24 hours.

A "quiet room" used in reducing equipment noise of a U.S. aircraft manufacturer is so sound-proof that you can hear your heartbeat as you walk through it.

An oil filter will remove a pound or more of dirt and sludge from a car's oil during 5000 miles of driving.

IN THE LABORATORY. When this photo was taken, the impact cleat had smashed into the nylon cord tire more than 300,000 times. Ordinary tires will stand only one-fifth as many blows.

ON THE ROAD. The roughest test of all—billions of miles of continuous service on heavy-duty trucks have proved nylon's lasting strength and superior performance.



TEST AFTER TEST PROVES NYLON TIRE CORD GIVES EXTRA STRENGTH FOR EXTRA SAFETY



Powerful advertising campaign will appear throughout the year in these influential magazines. This series of Du Pont nylon cord tire ads tells customers of nylon's lasting ability to shrug off the abuse of "just-around-town" driving and thus offer utmost safety on the highway.

Today's heavier, more powerful cars and sustained-speed superhighway driving put added strains on tires, mile after mile. That's why motorists need tires with the lasting strength and safety of nylon cord.

Nylon cord tires reduce unsprung weight, and nylon's shock-absorbing toughness can take the added strains of power steering, braking and higher horsepower. Nylon cord resists unseen bruise damage that can often seriously weaken a tire and lead to blowout. In fact, nylon cord gives added protection against *all* four major causes of blowout: heat, moisture, flex fatigue and bruise damage.

Surveys and rising sales both show that today's motorists know and want the extra strength and extra safety of nylon cord tires.

Du Pont produces the nylon fiber.

All tire manufacturers make nylon cord tires.



REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Today, the strongest, safest tires are made with nylon cord

Ceramic Tooling at Ford

(Continued from page 61)

highlights of the first ceramic production application—finish-turning and facing of the transmission sliding gear. The blank is forged from SAE 5135 steel, machined at a hardness of 170 to 207 Brinell. The job is done in a Sundstrand automatic lathe.

The setup requires the use of five tools, three of these being ceramic, two cemented-carbide. The two carbide tools were retained because ceramic

tools could not be accommodated for the specific applications. The grooving tool, for example, is narrow and cannot be clamped and, consequently, must be brazed in place. The other is a facing tool, operating from an auxiliary slide with no provision for clearance on the return stroke.

Originally turning was done with cemented-carbide tools at the rate of 450 sfpm, feed of 0.013 in./rev., and

0.020 in. depth of cut. With this setup the triangular cemented-carbide insert gave a life of 350 pieces per corner.

With the adoption of ceramic tools, spindle speed was increased to about 1000 sfpm with the same feed rate. Using a throw-away type triangular ceramic insert, tool life at the outset had increased to about 500 pieces per corner while floor-to-floor time was reduced from 0.507 to 0.375 minutes. With subsequent improvements in tool materials by the supplier, tool life was upped to over 900 pieces per corner accompanied by an improved surface finish of high luster.

Looking at the reduction in floor-to-floor time, it is obvious that ceramic tooling was responsible for a reduction of 26 per cent. Moreover, the increased productivity made it possible to release one of the Sundstrand lathes—two were used before—for another operation, one machine being sufficient to handle the required volume.

With its present background of experience the Manufacturing Engineering Office is continuing its study of the comparative merits of commercially available cutting tool materials. In seeking profitable applications, its personnel works cooperatively with the personnel of the various divisions.

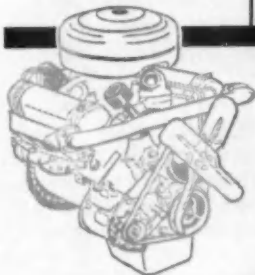
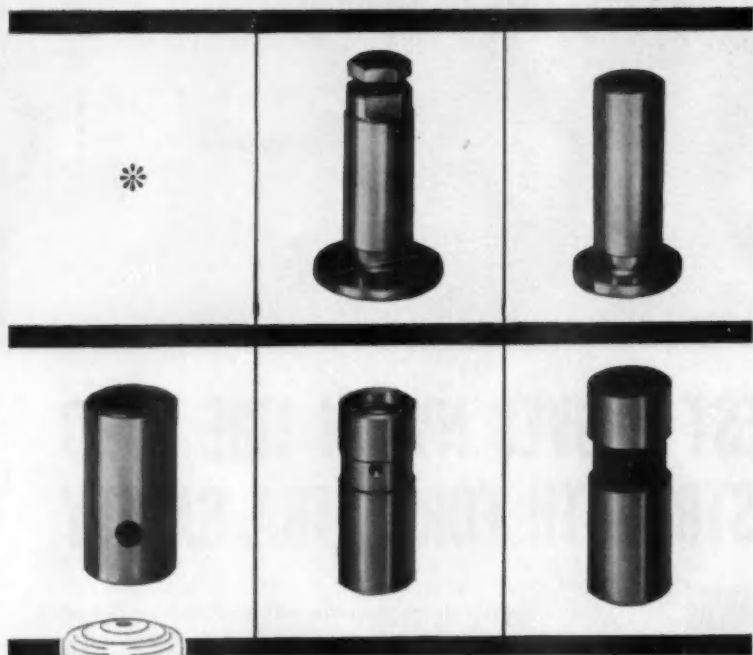
Current experience suggests that the machine tool industry will find it necessary to develop machine tools capable of getting the maximum performance out of the cutting tools now evolving. It will require more power, and higher speeds, of course. But above all, the new cutting tool materials are so sensitive to minute vibrations that it will be necessary to provide spindles of advanced design—more rugged, more rigid, and free from even small runout. Consequently, the spindles of the new crop of machine tools will have to have some of the characteristics of the spindles supplied today on fine grinders and precision-boring machines.

Although industry-wide attention is being focused on ceramic tools, it now appears that current developments have spurred the producers of cemented-carbides to further efforts. Some experimental super grades of cemented-carbides supplied recently appear to compare favorably with the available ceramic materials.

Since Ford has devoted considerable time and effort in its experimental ceramic tool program, it may be profitable to study some generalizations recently summarized by Manufacturing Engineering.

1. Ceramic tools are capable of higher speed than tungsten carbide tools; it should be men-

JOHNSON *tappets*



keep pace with today's engines

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration.

Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance.

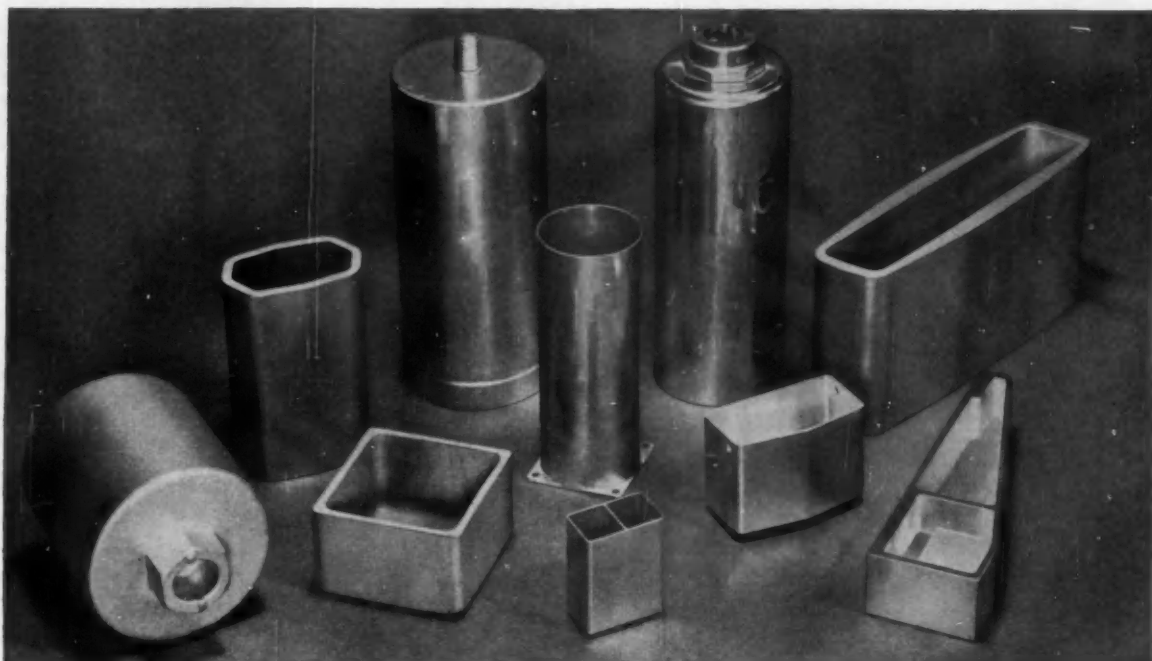
Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"Tappets are our business"

JOHNSON PRODUCTS

INC.

MUSKEGON, MICHIGAN



SIMPLIFY DESIGN, GAIN SUPERIOR STRENGTH!

Specify Hunter Douglas Aluminum Impacts

Hunter Douglas Aluminum Impacts are solving a lot of important design problems in all types of industry. Here are quick answers to everyday questions.

HOW DO IMPACTS DIFFER FROM COLD FORGINGS? Basically, only in material used. "IMPACT EXTRUSIONS" are thin walled components extruded from 2S or soft material. "COLD FORGINGS" are thick walled shapes made from heat treatable aluminum alloys. For simplicity, we'll consider both synonymously.

HIGH STRENGTH—You will find all the properties of forged structures in impacts—exceedingly dense, fine grain, strength and toughness with unusual freedom from porosity and internal flaws...a natural for *high pressure applications*, either gas or liquid. In impact extrusions, flow lines actually follow part contours, adding extra strength. Often strength is satisfactory as extruded, without subsequent heat treatment. Our new alloy, HDX, gives tensiles as high as 85,000 psi with minimum yield strength of 80,000 psi for highly stressed applications.

GREATER SIMPLICITY—Complicated multiple piece assemblies can often be replaced with a single impact. An integral

impact eliminates mechanical and/or welded joints and results in a smooth surface, unbroken by seams.

MORE DESIGN FLEXIBILITY—Generally, we can put extra metal where it's needed or thin up sections where required...like making bottoms of cans thicker than walls, adding integrally forged cavities or bosses of any shape, internal or external. Fluted or ribbed sidewalls, either decorative or functional, are easily produced by impact extrusions.

TOLERANCES—Hunter Douglas shines on accuracy...holds tolerances as close as $\pm .005$ " on specific diameters and matches screw machine tolerances on wall thicknesses.

ZERO DRAFT—If you want straight, uniformly thick sidewalls, Hunter Douglas Impacts are for you. Zero draft cuts all unnecessary machining and reduces metal waste. Impacts usually require only trimming, drilling, tapping or minor clean-up.

SMOOTH, BRIGHT SURFACES—There's no scale or rust and surfaces range up to 125 microinches, as extruded...plenty

smooth for lithographing or painting without secondary finishing. Real dazzlers result by polishing, satin finishing or anodizing. For extra wear or corrosion resistance anodizing is the answer.

UNLIMITED PART GEOMETRY—We've made impacts round, square, rectangular, triangular, octagonal and most other shapes. We do best if parts are symmetrical along the center axis, but good tooling often solves even a tough design problem. A sketch will enable us to advise or suggest means to an end.

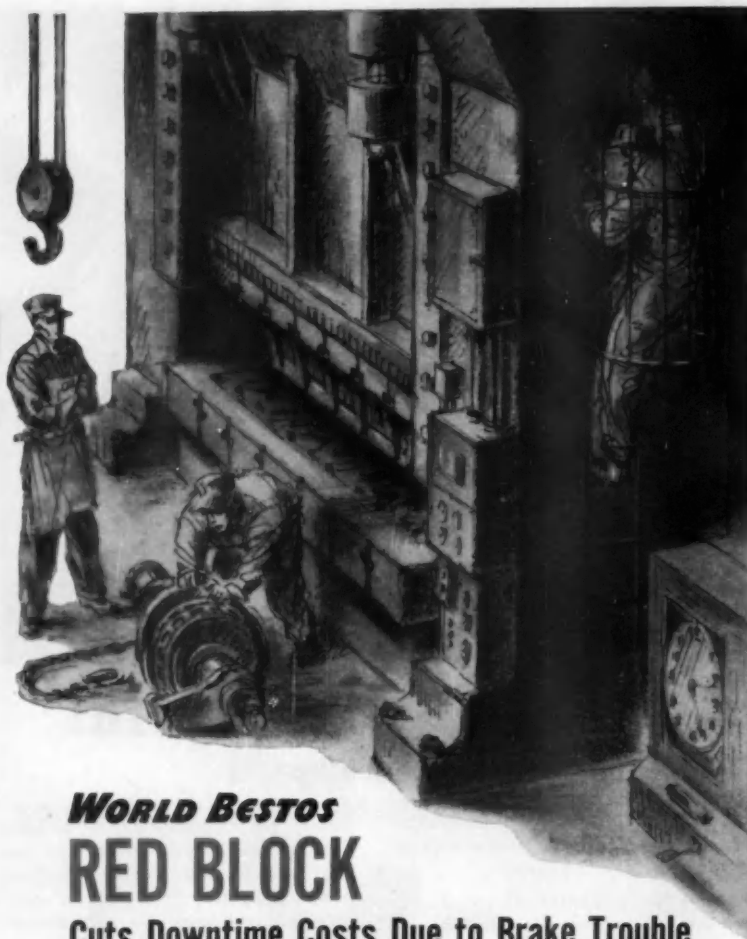
WHERE TO USE IMPACTS—Here are rule-of-thumb considerations: hollow parts with one closed end; walls or surfaces of zero draft; lengths of 6 to 8 times O.D.; strength of hammered or pressed forgings; integral ribs, bosses or webs; tolerances of $\pm .005$ "; typical surface finishes of 125 microinches; concentric, multiple diameters.

WE'D LIKE TO HELP—Our booklet gives valuable impact and cold forging information and our engineers are eager to advise. Simply write on your letterhead we'll do the rest.




Hunter Douglas Aluminum Corporation

HUNTER DOUGLAS ALUMINUM CORPORATION • DEPT. AI-2, RIVERSIDE, CALIFORNIA • TELEPHONE Overland 3-3030



WORLD BESTOS RED BLOCK

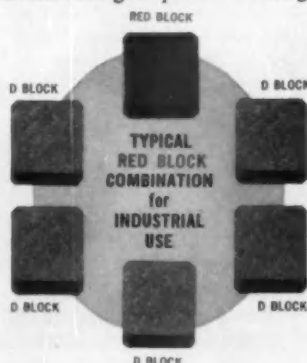
Cuts Downtime Costs Due to Brake Trouble

Up to 600% longer wear . . . major reduction in downtime costs . . . that's the amazing story of RED BLOCK performance on brakes and clutches—wherever it's in use!

World Bestos RED BLOCK brake sets *can't* fade . . . they're the only linings that supply *guaranteed no-fade performance even under stepped-up operating conditions*. RED BLOCK gives *positive* braking power at highest operating temperatures . . . let's you "pin-point" stops where you want them, when you want them.

Try RED BLOCK next time you're "braking up" . . . ask for it when you buy new equipment. You'll soon see how much less the best really costs.

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WORLD BESTOS NEWCASTLE, INDIANA

DIVISION OF THE

Firestone
TIRE & RUBBER COMPANY

Brake Blocks and Linings • Clutch Facings
• Transmission Linings • Spring Liners
and Buttons • Special Friction Materials

tioned that the concept of some people that ceramic tool life is best at very high speeds is erroneous. Optimum tool life is obtained at speeds slightly higher than those normally used with tungsten carbide tools.

Overall economy of operation, however, may be attained at speeds higher than indicated for optimum tool life, because of the advantages gained through reduction of the machine cycle time.

2. Best results have been obtained with continuous cuts at moderate feeds and depth of cut on clean surfaces. Claims have been made that improved tool materials will allow heavy interrupted cuts through scale.
3. The diameter of the chip curl produced affects tool life. Best tool life has been obtained when a moderate loose chip curl was generated.
4. The finish obtained on the workpiece is equal to or better than that obtained with tungsten carbide tools, and higher luster is produced.
5. Coolant is not required for ceramic tools, although it might be desirable in some applications to maintain low temperature on the workpiece.
6. Anti-cratering properties of ceramic tools are superior to those of tungsten carbide tools.
7. Grinding of ceramic is more critical than grinding of tungsten carbide. This has led to the use of throw-away type ceramic inserts which eliminates regrinding, and appears to be economical.
8. It is believed advisable that future machines should be adaptable to higher speeds and horsepower. Also, that construction of work spindles, and the rigidity of machine members, work holding devices, and tool support should be governed accordingly.

AUTOMOTIVE INDUSTRIES . . .

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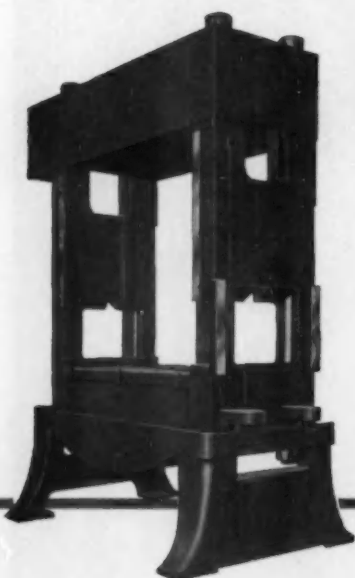
7899

if you manufacture parts
like these....



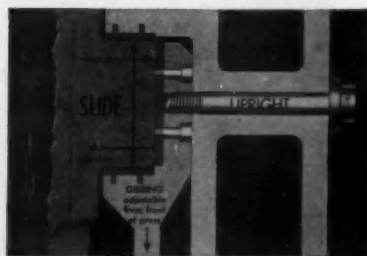
A BLISS HIGH PRODUCTION PRESS
may triple your output... or more

EXCLUSIVE DESIGN FEATURES... *assure accuracy
at high speed*

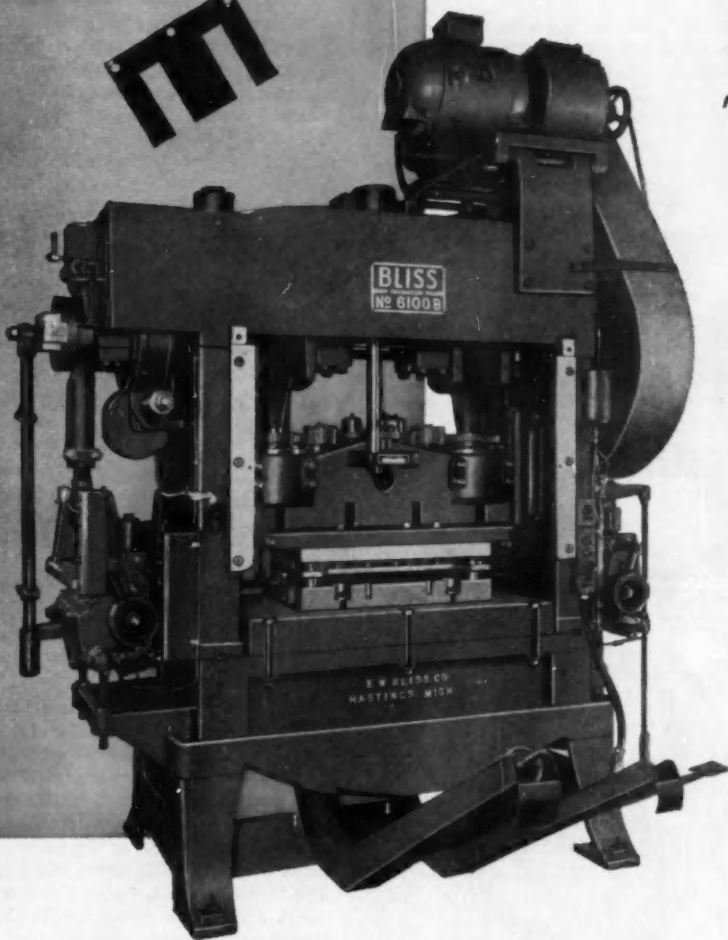


RUGGED FRAME: The dense, cast Meehanite frame *absorbs sound*, eliminates ringing "ping" at high speeds. Heavy four-piece frame members are keyed and joined by steel tie rods which are "pre-shrunk" to a tension greatly exceeding press capacity. Extra heavy sectioned bed and crown holds deflection to a maximum of 0.001" per foot at press capacity under normal loading conditions. Heavy reinforced crown gives extra support to the shaft. The design of the frame leaves plenty of room for die set up—provides chute space under the press.

VARIABLE SPEED DRIVES are standard on H-P presses so that each job can be run at its most efficient speed.



SQUARE GIBS provide precision fit—no more than a 0.0015" feeler goes between gib and slide, although slide moves freely. Location of gibs close to centerline resists tendency of slide to tilt under off-center loads—slide is held parallel to bed within 0.0005" per foot on all dimensions.



Long runs not essential, users report

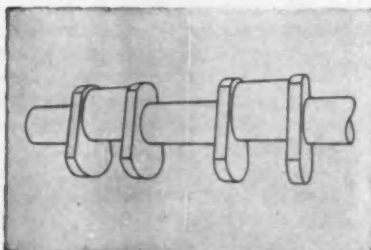
"we set up in 15 minutes, run 3000 parts in another 10..." is typical experience

Consider this: a Bliss H-P Press is usually able to replace from 3 to 12 older and slower presses. And the savings in space, tooling and handling costs alone are often enough to write off the cost of a H-P press.

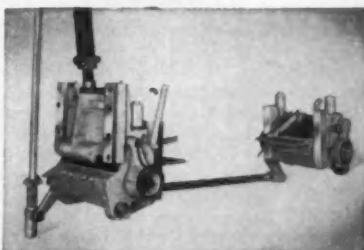
But the really important saving is in the cost of the parts themselves, because you get so many more so much faster and dies last so much longer.

Fast set-up makes that true for both long and short run work. IBM, for example, needs only eleven H-P presses to turn out multi-thousand quantities of more than 1500 different parts every three months. Their average set-up time: 48 minutes.

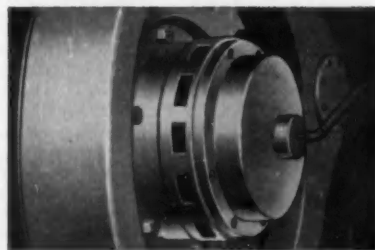
H-P presses are available from 12 to 300 tons, non geared or single geared. Special designs, special feeds extend their use to practically all stamping requirements. We'll be glad to send you complete information by return mail.



COUNTERBALANCED to eliminate vibration. Slide and tools are counterbalanced by means of air cylinder in crown. Where top speed of press requires, the crankshaft is dynamically balanced and the throwblock for the feed is balanced by a compensating weight on the feed adjusting screw.



BLISS FEEDS: Bliss makes its own single roll, double roll and special feeds to assure accurate feeding at high speeds. Typical of Bliss design is its roll feed clutch—with eight or more rollers bearing on *Stellite* inserts in the hub, it gives greater accuracy longer.



AIR FRICTION BRAKE AND CLUTCH: Special design gives die setter and operator complete and accurate control of the press. Air pressure can be set so clutch will slip under severe overloads. In addition, this cool-running clutch automatically adjusts itself for wear.

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The BUSINESS PULSE

(Continued from page 98)

rising trend of Governmental expenditures. Existing uncertainties suggest, however, that a cautious attitude is prudent for the longer term. Investors apparently feel his way, to judge from the rather listless performance of the stock market so far this year. And the President's annual economic report in a sense reflects a comparable attitude, for it is optimistic in tone regarding the

short term but not unmindful of the uncertainties that relate to the more distant future.

The really big news in January was made in Washington, D. C. with the presentation to the Congress of the President's budgetary proposals for the fiscal year 1958. These showed clearly that the Eisenhower Administration's original primary objective of retrenchment in spending is no

longer of much practical significance. The need for generalized retrenchment was, in fact, nowhere mentioned in Mr. Eisenhower's budget message, but instead the emphasis was on increased expenditures to meet "urgent national responsibilities." Spending for fiscal 1958 is scheduled at a peacetime high of approximately \$72 billion, or \$3 billion more than the expected outlay for fiscal 1957. This prospective spending total will absorb all but \$1.8 billion of anticipated revenue for the period, which means that there is no leeway for any significant reduction in tax rates if the budget is to be balanced. This, at least, is President Eisenhower's view, and Congress is judged likely to adhere to it.

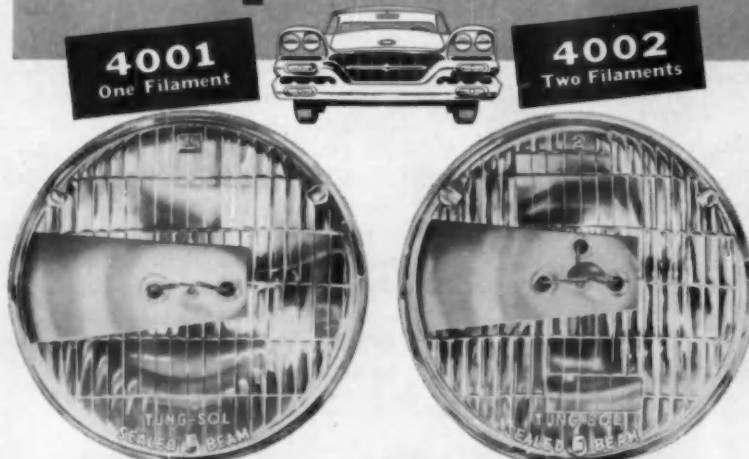
President's Budget Debated

What are the economic implications of these budgetary proposals? Are they inflationary or deflationary? Do they involve the risk of a "depression that will curl your hair," as Treasury Secretary George M. Humphrey has suggested? Unfortunately, no one can say with certainty, for the issues are too complex.

When the other prospective operations of Government for fiscal 1958, such as its trust-fund receipts and disbursements, are consolidated with the operations outlined in the conventional budget, it is estimated that total cash payments to the public for the period will total about \$83 billion and that total cash receipts will total about \$86 billion. Many people think that it is the cash surplus or deficit, rather than the conventional budgetary surplus or deficit, which is most relevant in assessing the economic implications of the budget. Specifically, a good many people automatically conclude that the Federal Government will exert an anti-inflationary influence on the economy during the coming fiscal year because it will be taking \$3 billion more from the people than it will be paying out.

Others point out, however, that this is not necessarily the case—that the influence will be anti-inflationary only if the Government's use of the surplus money results in a smaller utilization of it in transactions than would have occurred had the money remained with those who paid it to the Government in the first place. If the money is used to pay off Treasury obligations held by the general public, the procedure is anti-inflationary or deflationary only if the recipients hoard the proceeds or deposit them in banks which do not utilize them.

VISION-AID HEADLAMPS FOR 4-HEADLIGHT CARS



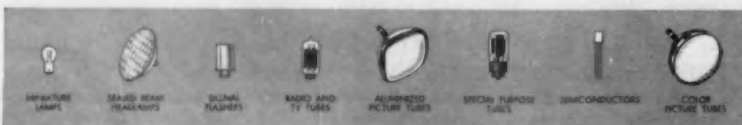
4001—This 5½" high beam lamp has its 37½ watt single filament positioned at the focal point of the reflector for maximum efficiency. Has E-Z Aim Platforms for quick daylight adjustment with all mechanical aimers or may be aimed by conventional methods. Locating bosses (seating lugs) on back of reflector permit correct installation in 4001 housing only.

4002—This 5½" lamp has a 37½ watt high beam filament and a 50 watt low beam filament. The low beam filament is positioned at the focal point of the reflector to deliver a greatly improved passing illumination pattern. The high beam filament delivers light that is supplementary to the high beam single filament lamp (4001). Low beam filament equipped with anti-glare fog cap. Lamp has E-Z Aim Platforms. Locating bosses (seating lugs) on back of reflector permit correct installation in 4002 housing only.

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AUTO LAMPS
SIGNAL FLASHERS

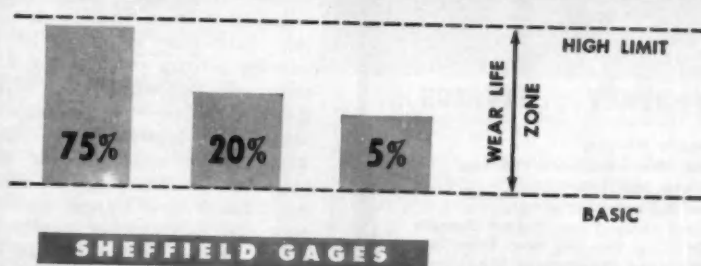
TUNG-SOL ELECTRIC INC.
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Sales Offices: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Denver, Colo.; Detroit, Mich.; Irvington, N. J.; Melrose Park, Ill.; Newark, N. J.; Philadelphia, Pa.; Seattle, Wash.; Canada: Montreal, P. Q.



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Especially supersensitive production equipment controlled by high amplification instruments, plus Master Craftsmen make it practicable to hold the finished size of Sheffield thread gages unusually close to the gagemaker's high tolerance limit.

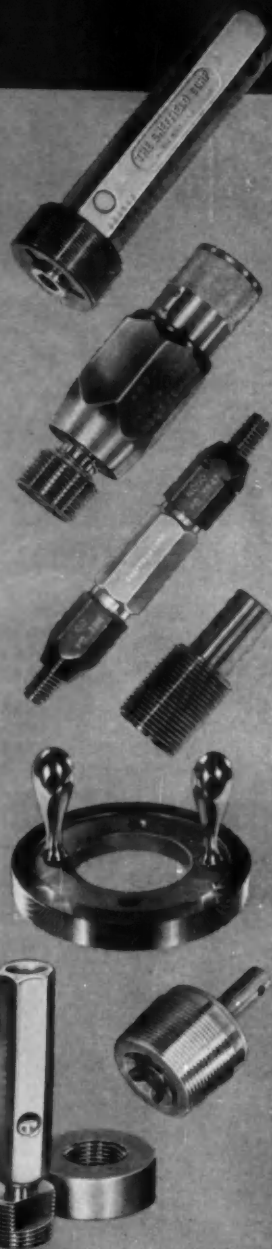


Purchasers of Sheffield thread gages can, on the average, expect to receive 75% of them within the upper third of the gagemaker's tolerance zone, 20% about half way and the rest between that point and basic.

SPECIFY SHEFFIELD and get more for your gage dollars.

SPECIFY "Reversible" Thread Plug Gages and save even more.

Gage Division 4, The Sheffield Corporation
Dayton 1, Ohio, U.S.A.

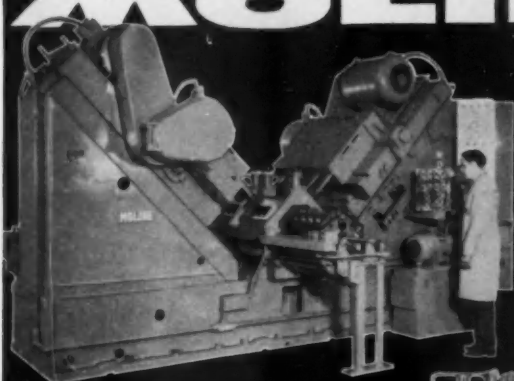


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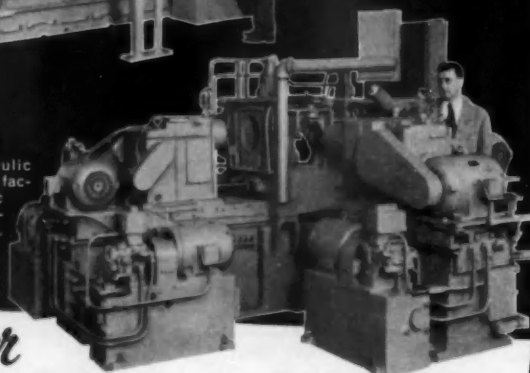


MOLINE



No. 13CB V-type cylinder boring unit is used either as an individual machine or as one of several automated units in a transfer line for boring automotive engine cylinders.

MR13B four-way, hydraulic feed, drilling, boring and facing machine with hydraulic clamping fixture for tractor main frame housings.

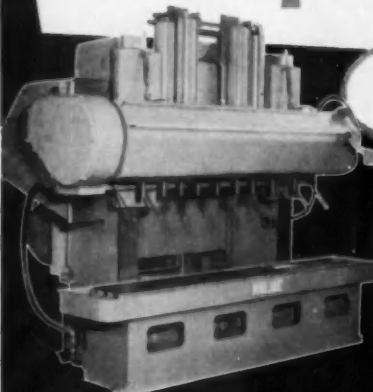


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- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

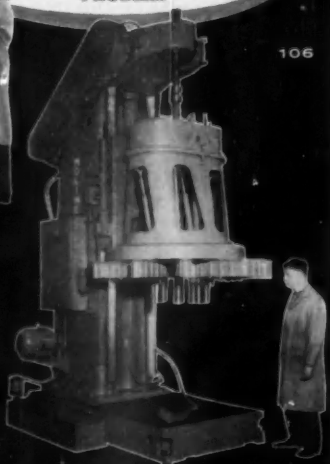


HD67 hydraulic rail feed, straight-line type, multi-spindle drilling machine. Six-foot rail length as shown; also available in eight and ten-foot lengths.

No. 116-U hydraulic rail feed, universal joint type driller with 16 two-speed and neutral top drivers plus four-speed quick change gear box. Spindles illustrated are 1½" drill capacity each in mild steel.



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EXPERIENCE IS AT YOUR SERVICE.
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PROBLEM



MOLINE TOOL COMPANY

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There can be no presumption that this will be the case under normal conditions. Of course, if the cash surplus is deposited with the Federal Reserve banks or is used to retire Treasury securities held by Federal Reserve banks, such action is anti-inflationary, provided the Federal Reserve System does not let the funds flow back into the money market. Thus, a number of assumptions have to be made about such things as the Treasury's use of the surplus, the liquidity preference of individuals and banks, the general state of business, Federal Reserve policy, and the effects of the Treasury's position on business and consumer psychology. Firm inferences are not possible.

Government Spending

Moreover, not all analysts agree that the net budget position is the vital aspect of the problem. Some stress instead the importance of the absolute levels of spending and taxes, whether or not these magnitudes are rising or falling. Thus, some observers hold that at times of high business activity (such as Mr. Eisenhower assumes will prevail in fiscal 1958) a big spending program that causes the Government to compete with private enterprise for scarce resources is inherently inflationary in character, even though the budget may show a moderate surplus. Still others reason that high tax rates are inherently inflationary, because they substantially reduce the net cost of expenditure. There are those who regard heavy taxation, even if matched by heavy expenditures, as deflationary in its long-term effects because it drains funds away from the public, thus reducing the profitability of business operations and restricting the spending power of consumers. Countless other points of view could be recorded, but those above are sufficient to indicate the complexity of the question and to demonstrate the unwisdom of broad generalizations concerning the economic impact of the budget.

AUTOMOTIVE INDUSTRIES . . .

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MANUFACTURING

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Technicalities

By John S. Davey

Bolts take greatest stress during wrenching

If a bolt doesn't fail when being wrenching up tight, it won't fail in service (assuming bolts and joint have been designed adequately for the loads).

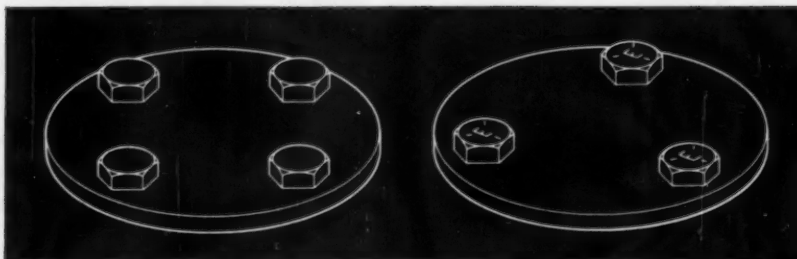
That's because two forces put stress on bolts (and cap screws) as they tighten: Tension due to bolt stretch; torsion due to friction. But only tension remains after wrenching. In a rigid joint, if this tension exceeds external forces, bolts will never experience any further strain, and will therefore not loosen or fail.

WHY SOME FAILURES?

Obviously, unusual unforeseen loads cause trouble. The instant they exceed residual tension, they add to the stress placed on the bolt and can cause immediate failure. Or they can cause loosening, leading to stress change, which in turn causes fatigue and failure. That's why you've got to torque bolts tight . . . and the tighter the better.

An exception: A flexible joint. With high cyclic loading, again loosening and fatigue cause trouble. Since you shouldn't tighten such a joint too much, sometimes the only remedy is to take out the flexible element and put in a rigid joint. (A metal to metal flange connection instead of a gasketed one, for example.)

Are you using more bolts than needed?



The stability of a 4 bolt arrangement can be matched by a 120° spacing of 3 bolts. Strength can be actually increased by using RB&W high carbon heat treated bolts (identified by "E" and three radial dashes).

NOBODY wants to use too few bolts or cap screws and risk failures. But using too many is not the best answer either. It means too many holes to drill, to fill — both costly.

RB&W offers some suggestions.

BALANCED BOLT PATTERN

By "rule of thumb," bolts are generally arranged symmetrically in a pattern of four. Yet three bolts 120° apart around a common center will prove just as stable, and save on assembly. With stability assured, the problem is then one of load capacity.

PRELOAD TO GET FULL CAPACITY

In checking size and number of bolts, calculate the stress and get rid of the excess. You have enough

if you've allowed for usual factor of safety . . . and the fasteners are tightened so that residual tension exceeds maximum external load anticipated. If they are, you have safety. The bolts will stay tight, won't fatigue, won't fail.

With RB&W standard fasteners, engineers and production men can take quality, uniformity and dependability for granted — and can concentrate on the problem of proper application and assembly. For help or information on your specific product, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

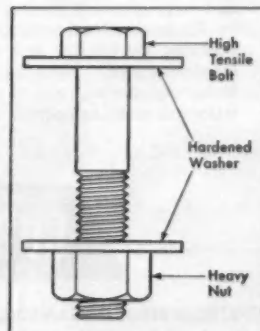
Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

High strength bolts stop joint failure from vibration

Shakeout equipment used by one company for unloading coal cars applied its vibration via a fabricated frame lowered onto the cars. This frame was originally riveted.

But it was a constant source of maintenance. About every 10 days, the frame had to be welded, loosened rivets replaced. Finally it was refastened with RB&W high tensile bolts and hardened washers. Maintenance now is nil!

Proving again that high strength bolts make the strongest connection for the severest service.



Bendix Electrojector

(Continued from page 53)

With either direct or port fuel injection, increased engine torque and horsepower are obtainable through the use of larger intake manifolds engineered for maximum air delivery and the elimination of intake manifold heat. Fig. 11 is a typical horsepower comparison test between a standard 4-barrel carbureted installation and the same engine equipped with a Bendix Electrojector fuel injection sys-

tem; Fig. 12 indicates the torque.

In a preliminary experimental road economy test with the Bendix Electrojector fuel injection system results obtained indicated better part throttle road economy as shown in Fig. 13. (Test results on some other installations were not as satisfactory.) Results as shown in Fig. 13 do, however, indicate a potential improvement in part throttle economy. For optimum results, the fuel injectors, manifold, and engine must all be compatible with each other. What the ultimate gains and improvements in part throttle economy will be is partially

dependent upon how well the fuel injection concept can be integrated into this overall engine design.

The foregoing article is an abstract of a paper presented by the authors at the SAE Annual Meeting in Detroit last month.

Society of Plastics Engineers

(Continued from page 57)

for a stress level reference. Blades totaled were 260. Strain gages were placed on several blades in stages 2, 4, and 6. The rotor assembly was dynamically balanced, speeded to 8400 rpm for three minutes, and check balanced, then placed in the engine and sent to the test cell.

A standard Air Force endurance test was employed, in which the engine was cycled between idle and military speeds, with intermittent runs at normal speeds. One full cycle requires five hrs. All plastics blades successfully completed 100 hr of testing.

Stresses were recorded for both the stainless steel reference blades and the plastics blades in stage 2. Maximum stress levels were recorded at engine speeds below 5800 rpm. At about that speed the stress level dropped rapidly to about 1/3 to 1/6 the peak values, and remained at this level up to the maximum speed.

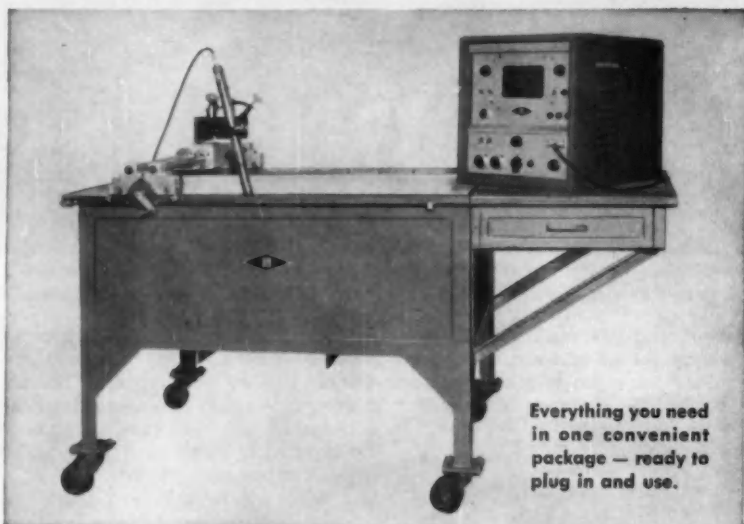
An approximate idea of engine performance was obtained from periodic reading of fuel and oil flow, turbine and compressor vibrations, tailpipe temperatures, thrust, etc. This indicated that performance of the engine was comparable to that of a conventional engine with stainless steel blades. A striking result was in the time required to go from idle to military speed under throttle burst conditions. With steel blades, this was from 10 to 14 seconds. With the rotor built up with plastics blades the time was reduced to 9 to 10 seconds.

A thorough visual inspection of the blades after the test showed no erosion nor corrosion.

While the tests strongly suggest the feasibility of using glass reinforced blades in jet engines, reliable data upon all useful mechanical properties at both room temperature and elevated temperatures must be obtained, and better resins must be evolved.

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Now Curtiss-Wright offers all the benefits of immersion ultrasonic testing of metal without the expense of an assembly of several costly separate units. This new low cost "package" combines in a self-contained single unit the Immerscope — the heart of the system — a four-foot tank, search tube and rack, precision manual manipulator, longitudinal and transverse manual scanning mechanism and a complement of crystals. Here is a complete immersion testing, quality control installation ready to operate, whether in

laboratory or light production — a system that can be readily expanded, with only minor investment, for more demanding production applications.

The technique is simple. Metal parts are immersed in water. Ultrasound is applied to penetrate the metal. Defects present will reflect the sound. Those echoes are presented as pips on the cathode ray tube of the Immerscope. Flaw detection is precise and positive.

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MEN in the NEWS

(Continued from page 94)

Delco Products Div., General Motors Corp.—Robert W. Leland has been named engineering manager for all electrical products; George W. Jackson, engineering manager for all automotive and mechanical products; Ralph K. Shewmon, engineering manager of research and development; and Irving M. Levy, consulting engineer.

Norton Co.—Richard H. Harris has

been made assistant controller.

Federal-Mogul-Bower Bearings, Inc.—Alan E. Carlson was made supervisor of districts; Elgin Oehler, assistant manager; and James W. Root, manager of the Pittsburgh District.

Chrysler Corp.—Cyril J. Firth has been named manager of the Los Angeles plant; F. S. Mitchell, plant manager of the Eight Mile Road plant, Detroit; Harry E. Eriksen, plant manager of the Kokomo, Ind., Die Casting plant.

Consolidated Electrodynamics Corp.—Mario A. Gardner has been named director of purchases.

Columbia-Geneva Steel Div., U. S. Steel Corp.—Leslie B. Worthington was named president.

Perfect Circle Corp. Manufacturers' Sales Div.—Joseph H. Reed and Walter E. Johnson have been named assistant sales managers.

AC Spark Plug Div., General Motors Corp.—H. L. Wardrop was chosen director of sales training, and J. Patrick Kane was made assistant general merchandising manager.

Buckeye Tools Corp.—Hal O. Gummere was elected executive vice-president, and E. B. Meynard was named vice-president of sales.

Ford Div., Ford Motor Co.—George H. Brown was made marketing research manager.

Allis-Chalmers Mfg. Co., Buda Div.—L. C. Daniels is now general manager.

AMP, Inc.—William J. Weber has been named manager of market research.

Du Pont Co.—Robert H. Pohl has been promoted to director of sales of the Pigments Dept., succeeding Fred-eric A. C. Wardenburg, now director of the Advertising Dept.

General Aniline & Film Corp., Ozalid Div.—James A. Travis has been named general sales manager.

Fruehauf Trailer Co.—J. W. Trauernicht was made director of industrial relations.

Boeing Airplane Co.—Donald J. Euler has been appointed director of operations planning.

L. A. Young Spring & Wire Corp., International Div.—Eugene J. Vineyard was named head.

Chrysler Corp. of Canada, Ltd.—R. J. Downey has been appointed director of purchasing.

Crane Packaging Co.—Carl E. Schmitz has been promoted to executive vice-president; Vance E. Vorhees, vice-president in charge of sales; B. H. Stenberg, vice-president in charge of manufacturing; and E. H. Stubenrauch, assistant general sales manager.

Tuthill Pump Co.—John W. See has been named regional sales manager in New England, New York, New Jersey, and the eastern half of Pennsylvania.

World Bestos—Richard C. Rohde has been named district manager of Territory 10.

Budd Co.—Oliver W. Hamilton has become a corporate economist.

(Turn to page 138, please)



DOLE DV THERMOSTATS

the accurate temperature control for modern engines

Highly developed for positive operation against the increased pump pressures in sealed cooling systems, and with all types of antifreeze solutions. Helps maintain best engine performance—speeds warm-up—saves gasoline and oil—reduces wear. Gets more heat from the car heater.

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Consider your press operator when you consider an O.B.I.

We've talked to a lot of press operators about our Clearing O.B.I.'s. "We like them," they tell us, "they're easy to run. Quiet. And you have a feeling that they can't go wrong on you." Frankly we listen real good to a press operator because he can tell us a lot about our equipment. In fact, the safety designed into our O.B.I.'s—the simple cleanliness of the design, the accessibility of controls—these things were figured from the needs of the man running the machine.

The quiet operation that operators like—well

that's just a function of fine construction of Clearing O.B.I.'s. Sort of a bonus factor you might say. Next time you see a fellow running a Clearing O.B.I., ask him how he likes the machine. It's an important point. An operator who likes his equipment will do a better job. If he feels safer, his morale is better. These things mean improved production, a happier shop. And a happy shop is usually a profitable one.


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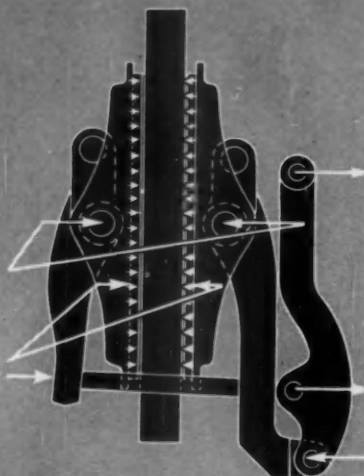




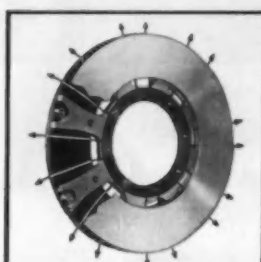
It pays to specify Tru-Stop Brakes

They give you—

- Real emergency braking**
- Smooth, positive stops**
- Safe parking**
- Lower service costs**



TRU-STOPS are real emergency brakes—not just parking brakes. They serve as auxiliary brakes on long down-grades and can bring the vehicle to a smooth, quick stop if service brakes should fail suddenly. TRU-STOPS can do this and more. They can handle the vehicle with safety so that it can be removed from the road.



Air-Cooled

• The terrific heat generated in braking shortens lining life. TRU-STOP design quickly dissipates this heat. Most of the disc is exposed to the air even during braking. And a jet of cooling air circulates between the disc blades and carries off heat.

Smooth, positive stops are assured as the pressure is in direct proportion to the pull on the brake lever. There is no dangerous self-energizing or "over-braking."

TRU-STOPS hold on grades for safe parking. They prevent parking brake accidents.

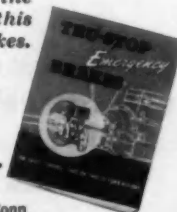
Lower service costs come from the fact that TRU-STOPS are mounted directly on the drive shaft. Their simplicity of design and accessibility reduce maintenance requirements. Relining or adjustment is a simple job for any mechanic with ordinary tools. It is not necessary to drop the drive shaft.

Specify TRU-STOPS for factory installation on the next vehicle you buy. Send for your copy of this booklet—the complete story of TRU-STOP Brakes.



**Automotive and Aircraft Division
AMERICAN CHAIN & CABLE**

601 Stephenson Bldg., Detroit 2
2216 South Garfield Ave., Los Angeles 22 • Bridgeport 2, Conn.



MEN in the NEWS

(Continued from page 136)

De Soto Div., Chrysler Corp.—**Sam Petok** was appointed public relations director.

New Process Gear Corp.—**Regal C. Meier** was elected vice-president; **Ernest M. Allman**, secretary-treasurer and member of the board; **Robert W. Wolfe**, member of the board; and **William L. Crowley**, assistant secretary; **Robert W. Wolfe** was made general sales manager, and **Thurman O. Ruettinger** was named chief engineer.

Air Reduction Co.—**George E. Hawkins** was elected executive vice-president.

Clark Equipment Co., Industrial Truck Div.—**Bruce W. Thayer** is now manager of the new Chicago sales and service branch.

Pratt & Whitney Co.—**John G. Fitzgerald** has been named assistant director of public relations.

Cambridge Corp.—**John M. Eagleston** and **James A. Graham** have been elected vice-presidents.

Howe Scale Co.—**F. E. Pringle** was named assistant general sales manager.

Sherman Products, Inc.—**Eli R. Lupin** has been named chief of engineering and development.

General Metals Corp.—**Michael E. Conway** has been promoted to public relations director.

Chrysler Corp.—**Don Tucker** has become supervisor of public relations services.

H. W. Loud Machine Works, Inc.—**Nicholas M. Esposito** is now production manager.

Molded Fiber Glass Sheet Co.—**Robert V. Gilbert** has become sales manager.

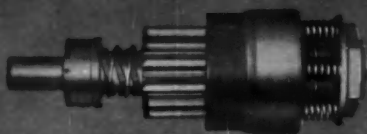
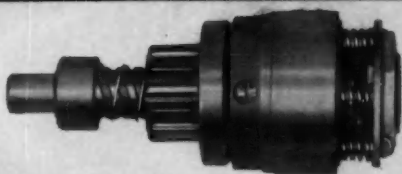
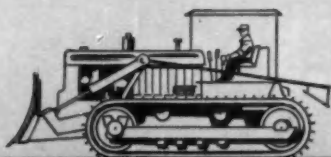
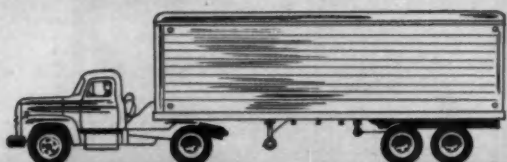
Kellett Aircraft Corp.—**Leonard Goland** has been made director of research.

General Electric Co.—**Frederick J. Burnett** has been named manager of alkyd resin product sales in the Chemical Materials Dept.

Renault of France—**Desmond W. Gordon** has been named American sales promotion manager.

Fastex Div., Illinois Tool Works—**John E. Lane** has been promoted to district sales manager of the Detroit district.

(Turn to page 142, please)



BIG OR SMALL . . . BENDIX DRIVES START THEM ALL

Throughout the world of transportation it's an accepted fact that *you start with Bendix!* And it's not surprising. Bendix* Starter Drives have been synonymous with dependability for fifty years in the automotive field. They've proved themselves just as reliable on submarines, aircraft, earth movers, outboard motors, helicopters. In fact, every type of internal-combustion

engine ever built has used a Bendix Starter Drive. Hospitals use Bendix Drives to activate their stand-by equipment. Air raid sirens across the country are started with Bendix Drives. It's logical to believe that such universal acceptance indicates a standard of quality which no other manufacturer has been able to match. Need we say more?

*REG. U. S. PAT. OFF.

Bendix-Elmira, N.Y.

ECLIPSE MACHINE DIVISION





The Life Line in the Jeep Line is the Spicer Drive Line



Newest in the world-renowned Willys Jeep Line is the revolutionary Forward Control FC-150 4-Wheel Drive Truck.

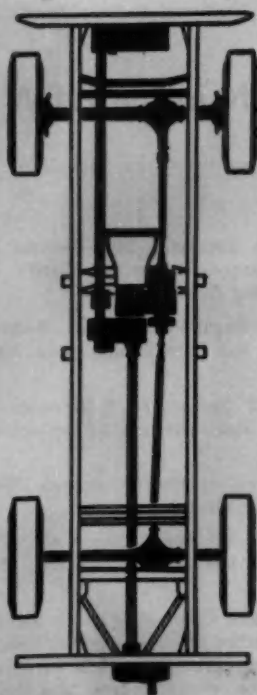
This Forward Control truck innovation puts a 74" pickup box on an 81" wheelbase—a record-breaking cargo space per inch of wheelbase!

These exclusive features of Forward Control and cargo capacity, plus famous Jeep "go-anywhere" maneuverability, are attained with the advantages of the Spicer 4-wheel drive line.

Born and baptized under the emergencies of World War II, the Spicer 4-wheel-drive assembly has served military and civilian needs with performance records impossible to attain with any other type of drive.

90% of the world's small-vehicle 4-wheel-drive assemblies, which include axles, joints, shafts and transfer cases, have been supplied by Spicer. The experience gained by Dana in the design and production of these efficient drives is your assurance of dependable service.

DANA CORPORATION • TOLEDO 1, OHIO



Diagrammatic view of the new Willys Forward Control Jeep FC-150 showing the Spicer 4-Wheel-Drive Assembly, including axles, joints, shafts, transfer case; and front, center and rear Power Take-Off points.



Spicer

SPICER PRODUCTS: Transmissions • Universal Joints • Propeller Shafts • Axles • Torque Converters • Gear Boxes • Power Take-Offs • Power Take-Off Joints • Rail Car Drives • Railway Generator Drives • Stampings • Spicer and Auburn Clutches • Parish Frames • Spicer Frames

you can cut your GLOVE COSTS



with the authorized **JOMAC** COST-REDUCTION PLAN

- 1 Jomac will analyze your working conditions and glove requirements
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Your glove costs *can* be reduced. To make *profitable* use of this plan, write to Jomac Inc., Dept. H, Philadelphia 38, Pa., and say "Reduce my glove costs."

JOMAC INDUSTRIAL GLOVES

Plants in Philadelphia, Pa., and Warsaw, Ind.
In Canada: Safety Supply Company, Toronto

MEN in the NEWS

(Continued from page 138)

Delco Appliance Div., General Motors Corp.—**Vaughn H. Hardy** was appointed chief engineer.

Centrifugal Foundry Co.—**Ralph K. Lorton** has been named plant manager.

World Bestos—**J. W. Greenen** has been named manager of replacement sales.

Chromalloy Corp.—**Joseph Friedman** was elected president.

Champion Spark Plug Co. — **Roy Hummel** has been made factory manager.

Landers Corp.—**Robert G. Landers** was elected board chairman; **John P. Howland**, president; **John Siegmann**, executive vice-president and treasurer; and **Timothy Y. Hewlett, Jr.**, secretary.

Four Wheel Drive Auto Co.—**Lloyd L. Pernot** has been promoted to director of sales engineering.

Precision Castings Co.—**Gordon C. Curry** was named general sales manager.

Eaton Mfg. Co., Spring Div.—**George L. Rademaker** is now chief engineer of the Leaf Spring Dept.; **Robert G. Green**, assistant sales manager of the same department; and **Robert D. Morrison**, assistant sales manager of the Coil Spring Dept.

Steel Improvement & Forge Co.—**H. Arthur Zimmerman** was named vice-president in charge of sales; **George D. Gotschall**, vice-president in charge of manufacturing; and **Albert W. Smith, Jr.**, vice-president and director of finance.

U. S. Steel Corp., American Steel & Wire Div.—**Charles P. Greenlee** is now manager of the Detroit district sales department.

U. S. Steel Corp., Advertising Div.—**John Vekley** was made director.

Delco Products Div., General Motors Corp. — **G. F. MacFarland** is now assistant chief engineer.

Arcos Corp.—**Royal D. Thomas** has been appointed chairman of the board; **James E. Norcross**, executive vice-president; and **Henry A. Molt**, vice-president in charge of manufacturing.

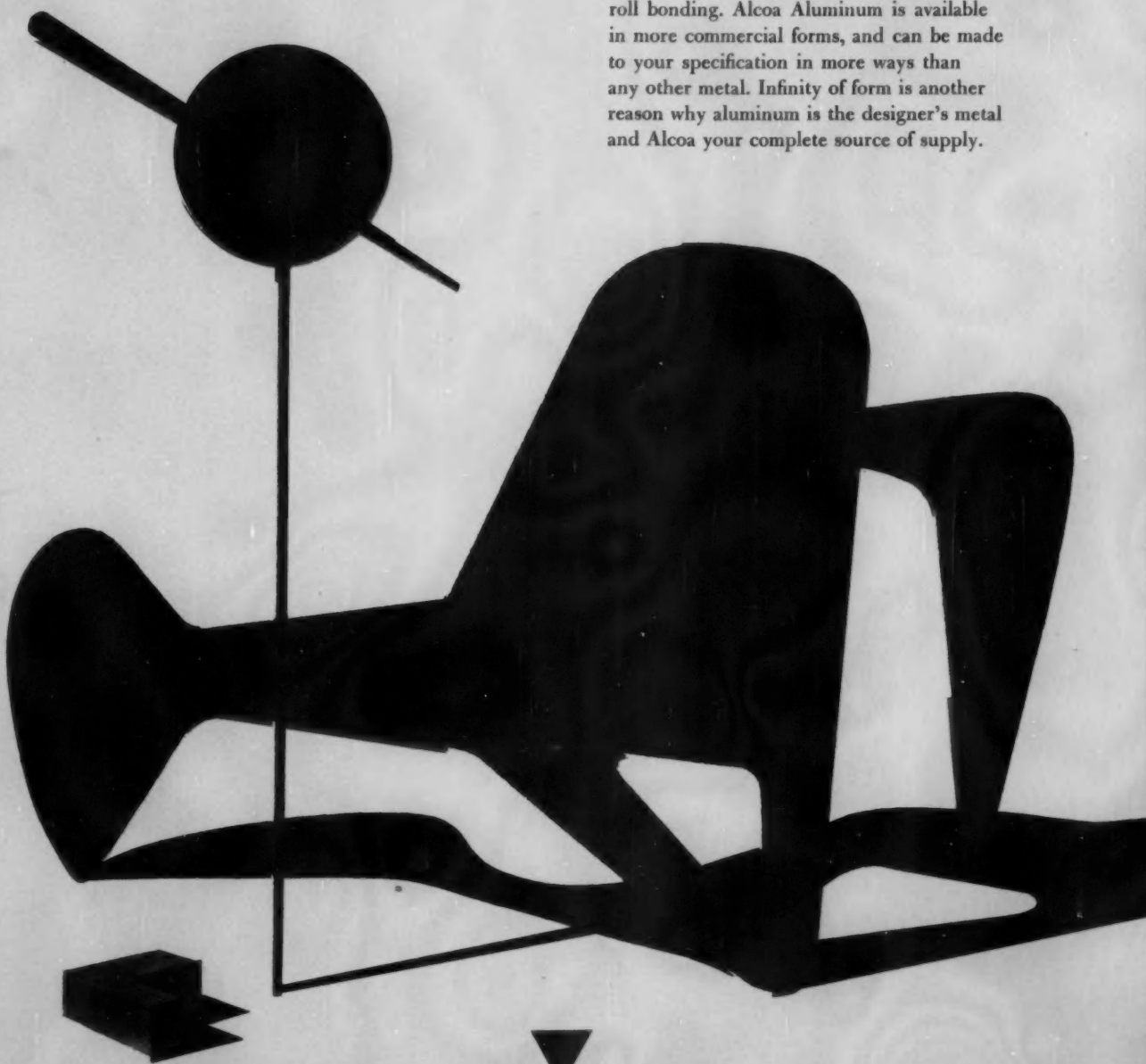
Du Pont Co.—**William C. Kay** has become assistant general manager for the Organic Chemicals Dept.

(Turn to page 147, please)

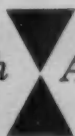
Aluminum is Form

ALCOA® is Aluminum

How many forms of this obliging metal do you see in a day? Strong forgings in a screaming jet fighter. Delicate foil yarns in milady's gown. Functional beauty in the spun curves of a coffeepot. Aluminum is the most versatile of all design materials. Cast it, form it, roll it, forge it, extrude it, impact it. No fabricating process is foreign to this metal. Machine it . . . limited only by machine feeds and speeds. Join it by every common fusion process . . . plus unusual ones like cold welding and roll bonding. Alcoa Aluminum is available in more commercial forms, and can be made to your specification in more ways than any other metal. Infinity of form is another reason why aluminum is the designer's metal and Alcoa your complete source of supply.



Look forward with



ALCOA

HERE'S A SOLID FOUNDATION FOR IMAGINATIVE DESIGN IN ALUMINUM

In Alcoa's library are many publications prepared with but one objective: to help designers and fabricators learn the basic facts about aluminum. How to design with it. How to work it. How to join and fasten it. How to capitalize on its unique advantages to get better, longer lasting, lower cost products.



Among the newest are these . . .

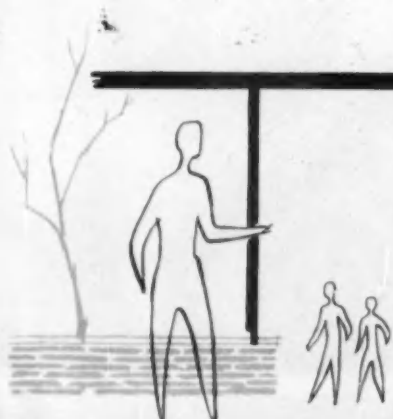
Finishes for Alcoa® Aluminum—a colorful, penetrating handbook prepared by the men who know the most about aluminum finishes. It includes all of the latest and most exciting finishes and tells how to achieve them.

A New Horizon in Extruded Shape Design—a thorough text designed to stimulate imaginative thinking about designing and applying extruded aluminum shapes.

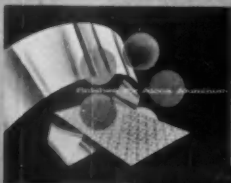
Metal in Motion . . . Alcoa Impacts—the very latest facts on this fascinating way to produce complex shapes in aluminum with a single press stroke.

In addition to these newest Alcoa publications, the Alcoa library has hundreds of others, plus dozens of motion pictures. Most of these are described in a 41-page index called *Alcoa Informational Aids*. All of these films and publications are available from Alcoa for your use.

Order this index and these newest publications right now. Send your name, address and company affiliation to ALUMINUM COMPANY OF AMERICA, 2192 Alcoa Building, Pittsburgh 19, Pennsylvania.



THESE LATEST ALCOA BOOKS

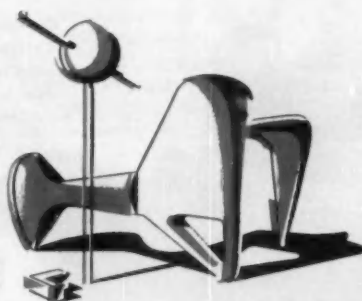


THESE LATEST ALCOA FILMS



Look forward with Alcoa

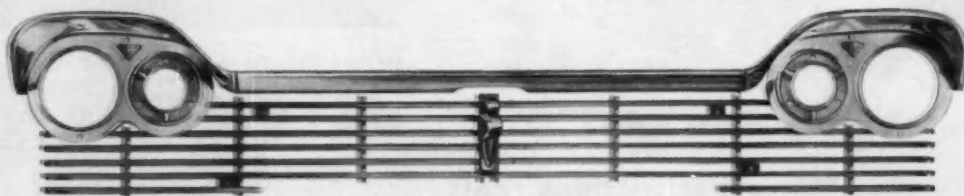
From Auto-Lite:
The appeal
of FORM




The sales appeal of aluminum trim is enhanced by the myriad of forms in which this lovely metal can be shaped. The Electric Auto-Lite Company forms the grille and bezels shown below from Alcoa® Aluminum and anodizes it on one of the most modern production lines in the United States.

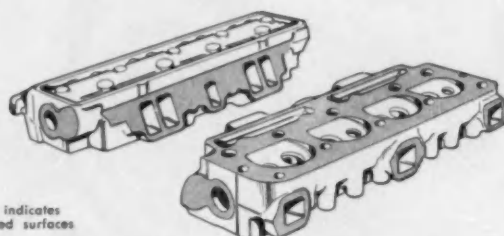
For sales-minded automakers, Auto-Lite also forms side panels, instrument panels, headlamps, name plates and insignia from man's most versatile metal. But what Auto-Lite really makes for the auto industry is customers.

Alcoa itself does not fabricate trim. But for more than 50 years, our research and development facilities have been put to work by leading automotive suppliers like The Electric Auto-Lite Company. The results of this long-time partnership are gratifyingly apparent: Alcoa Aluminum parts of the highest quality are being used on *every* 1957 car that rolls off the assembly line.



ALCOA  **ALUMINUM** gives every 1957 car more **GLEAM AND GO**

**CUSTOMER
SPECIFIED**



Line indicates
machined surfaces

A leading automobile company requested Kearney & Trecker's Special Machinery Division to design and build an automatic transfer machine to perform a series of milling and drilling operations on V-8 cylinder heads.

**KEARNEY & TRECKER
MILWAUKEE®
DESIGNED**



Kearney & Trecker built this 12-Station Automatic Transfer machine which rough and finish mills the head gasket surfaces, mills intake and exhaust port surfaces and both ends, and drills, counterdrills and reams two holes on each of two cylinder heads for V-8 engines. Machine's production rate is 100 pieces per hour.

The two cylinder heads progress automatically through the machine side by side, each on separate transfer rails. Transferring, locating, clamping, lubrication and chip disposal are all automatic.

Production efficiency starts with

Kearney & Trecker Milwaukee machine tools

This typical example reduced costs and meant higher production for the buyer. Kearney & Trecker's Special Machinery Division's 50 years' experience in machine design and manufacture can mean considerable savings to you.

Take advantage of our abilities. They can pay off in profits for you. See or write your Kearney & Trecker Special Machinery Division representative. He will be pleased to give you all the details on this production machine. Contact him today!

For more information on machine illustrated, ask for Data Sheet No. 1080. A new bulletin, SMD-56, which describes many of our outstanding designs, is also yours for the asking.



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Designers and Builders of Precision and Production Machine Tools Since 1898

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NEW YORK, N. Y.
Kearney & Trecker Corp.
409 Grand Ave.
Englewood, New Jersey

NEW ORLEANS, LA.
Stauss & Haas, Inc.
524 Camp St.

OMAHA, NEB.
Fuchs Mach. & Supply Co.
2401 N. Eleventh St.

PHILADELPHIA, PENN.
Machinery Assoc., Inc.
325 E. Lancaster Ave.
Wynnewood, Penna.

PITTSBURGH, PENN.
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4 West Monilla Ave.

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Harry M. Euler Co.
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Greene Machinery Co.
6300 Wyche Blvd.

DAYTON, O.
The E. A. Kinsey Co.
16 Washington St.

DENVER, COLO.
F. J. Leonard Co.
1219 California St.

DETROIT, MICH.
Kearney & Trecker Corp.
10400 Purlton Ave.

GREENSBORO, N. C.
Smith-Courtney Co.
239 S. Davie St.

HICKORY, N. C.
Smith-Courtney Co.
103 3rd Street, S.W.

HOUSTON, TEX.
Steel & Machine Tool Sales
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INDIANAPOLIS, IND.
The E. A. Kinsey Co.
1550 Stadium Drive

KANSAS CITY, MO.
Blackman & Nuetzel
Machinery Co.
1103 E. Armour Blvd.

LOS ANGELES, CALIF.
Moore Machinery Co.
3200 S. Garfield Ave.

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Machinery Co.
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301 N. St. Francis

CANADA
MONTREAL
OTTAWA
QUEBEC
TORONTO
WINDSOR

Williams & Wilson Ltd.

MEN in the NEWS

(Continued from page 142)

Carborundum Co. — A. Francis Politi was named assistant to the president on international activities; George E. McGuire, assistant vice-president; Jacques deBrabant, president, Carborundum S. A.; W. H. Wendel, group vice-president; John F. Claydon, general manager, and Herbert P. Dales, sales manager, respectively, of the Coated Abrasives Div.; Fred W. Scott, sales manager of the Bonded Abrasives Div.; Semon Stupakoff, vice-president; Robert Barr, general manager of the Stupakoff Div.; Arthur A. Turner, sales manager of the Refractories Div.; and D. S. Bowman, sales manager of the Gobar Div.

Joseph T. Ryerson & Son, Inc. — George B. Howell is now manager of sales of tubular products and cold finished steel bars at the Detroit plant.

ACF Industries, Inc. — Robert S. Bubb is now manager of commercial development.

Aro Equipment Corp., Air Tool Div. — Gene R. Voigt has been promoted to sales manager.

Boeing Airplane Co., Wichita Div. — Thomas A. Nelson has been named director of sales.

Vickers, Inc. — A. Trail is now manager of the Rochester, N. Y., district sales office.

Brown & Sharpe Mfg. Co. — Ermand L. Watelet was made superintendent of the Precision Tool & Gage Group; Duncan H. Doolittle, superintendent of the Miller and Grinding Machine Group; and Thomas C. Roberts, director of manufacturing engineering.

Four Wheel Drive Auto Co., Ground Support Equipment Div. — Wesley H. Peters has been named manager.

Bell Aircraft Corp. — Maurice J. Coughlin has been appointed director of procurement for the Weapon Systems Div., and Norman A. Lomas has been made purchasing manager for the Aircraft Div.

DeVlieg Machine Co., Machine Tool Div. — Herbert A. Beyer, Jr., is now sales manager.

Clevite Corp. — James J. Welker has been elected vice-president in charge of operations.



**YOU CAN
SAVE TIME,
TROUBLE
AND COSTS
with**

Formed Tubes...

★ Save Time

We have a huge stock of dies and, when needed, tooling's fast. We also avoid delays by making our own electrically welded steel tubing, sizes from ½" to 3" OD.

★ Save Trouble

Long, active experience with all tube forming processes and high standards of quality control make sure your orders will be completed right.

★ Save Costs

It's routine for formed tubes parts to deliver top performance, save weight, cut costs. Steel, copper, brass, aluminum or stainless tubing fabricated in ¼" OD to 6" OD sizes; from 20 to 11 ga. metal.

Formed Tubes, Inc.
203 Prairie, Sturgis, Michigan

Write for FREE Booklet



AI TABLOID AI

(Continued from page 94)

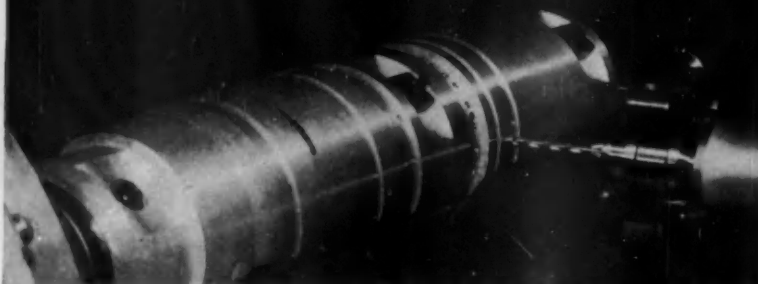
Westinghouse Electric Corp. has converted its four East Pittsburgh divisions into 10 basic product departments.

Midland Steel Products Co. has transferred its power brake and power control manufacturing operations to a new plant at Owosso, Mich. . . . Automatic Molding Co. has transferred its operations to a new plant at 3201 Exposition Place, Los Angeles 18, Calif.

India will erect a factory for the manufacture of jet engines.

Twin Coach Co. may manufacture a new airplane being developed by Frye Corp. of Ft. Worth, Tex.

PIONEER 921-T specified ALUMINUM TOOLING PLATE



42" DRILL JIG WITH 140-HOLE PATTERN HELD WITHIN $\pm .0005$ " BORING TOLERANCE

In contracting with Mechanical Specialties Co. for this complicated drill jig, Hughes Aircraft specified Pioneer 921-T to insure dimensional stability. Boring of the drill bushing pattern was held well within the .0005" tolerance allowed. Absolutely no distortion or movement occurred after the finish machining operation. You are safe with 921-T.

921-T GIVES YOU THESE ADVANTAGES

Pioneer 921-T reduces tooling costs because it is easily sawed, tapped, milled or welded. Being 100% stable, with high tensile strength and $\frac{1}{3}$ the weight of tool steel, 921-T meets every precision tooling requirement at lower cost. Its specialized alloy composition and method of manufacture guarantee absolute uniformity and insure against porosity, distortion and casting defects. Consult the Pioneer supplier nearest you, or write for complete information, catalog and case histories of 921-T usage in tooling operations such as yours.

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Warehouses: St. Louis, Mo.; Wichita, Kan.

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Warehouses: Atlanta, Ga.; Birmingham, Ala.; Louisville, Ky.; Memphis, Tenn.; Miami, Fla.; Nashville, Tenn.; Raleigh, N.C.; Richmond, Va.

MAPES & SPROWL STEEL CO.

Union, New Jersey

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TOOLING PLATE
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PIONEER CARRIES
THE LARGEST STOCK
OF AIRCRAFT
EXTRUSIONS IN THE
WORLD. WRITE ON
YOUR LETTERHEAD
FOR CATALOG LIST-
ING 3000 SHAPES.

Brainard Div. of Sharon Steel Corp. has disclosed plans for a new and greatly expanded program of product research and tool development for the entire strapping industry.

Westinghouse Electric Corp. has made the first major a-c crane installation in a steel mill.

Fruehauf Trailer Co. has filled out its line of Volume vans with new composite steel and aluminum units. They are available in straight or drop frame design, with either exposed post aluminum or smooth panel beaded aluminum panels.

Gulton-Speidel, Inc., is name of new electronics firm formed by the Industrial Div. of Speidel Corp. and Gulton Industries, Inc.

Mexican Automotive Parts Mfg. Co. has launched production at its new plant in Mexico City. Concern resulted from agreement with Bendix and Monroe for use of patents and technical assistance in production of shock absorbers, brake drums, and other parts.

Ryan Aeronautical Co. is building a new \$500,000 Engineering and Laboratories Building.

Westinghouse Electric Corp. scientists have perfected a new technique for taking pictures of the atomic "insides" of metals and other crystalline materials.

Classic Car Club of America will hold meetings every second Tuesday at Riverdale Memorial Post, American Legion, Riverdale, N. Y.

Dennis Bros., Ltd., of England has developed a new fire engine chassis incorporating a Rolls-Royce fully automatic transmission unit.

Plans are afoot to produce a new type of motor scooter known as the "Maserati" in Mexico.

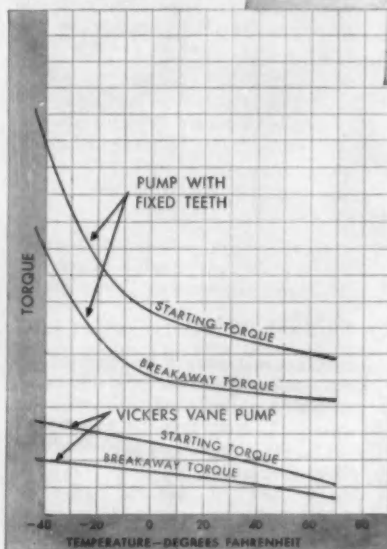
Aluminum Industries, Inc., has purchased Wisconsin Machinery & Manufacturing Co.

Vickers, Inc., has opened a new district office for aircraft products sales and service in Seattle, Wash. . . . Rolled Alloys, Inc., has opened a new office and warehouse in South River, N. J., for the distribution of high-temperature and corrosion-resistant steels.

(Turn to page 150, please)

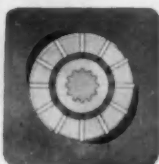
MUCH EASIER COLD WEATHER STARTING

Sno-Cat (without body) undergoing tests in extreme cold in the Pyrenees mountains preparatory to being used by French scientific expedition at the South Pole. Sno-Cats will also be used by the U.S. Navy and British Expeditions to the Antarctic.

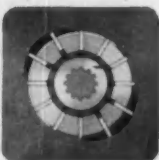


Curves based on comparative tests of a Vickers Balanced Vane Type Pump and an equal capacity pump with fixed teeth. Oil used in both was SAE 10W premium grade.

Schematic diagram of Vickers Balanced Vane Type Pump showing how sliding vanes are retracted at normal engine cranking speeds. No oil is pumped and there is practically no starting load.



Similar diagram shows how pump vanes are extended when engine fires. Pumping then begins and continues at all engine speeds (vanes are held in intimate contact with cam ring by system pressure in addition to centrifugal force).



Another Reason Why TUCKER SNO-CATS have **VICKERS®** Balanced Vane Pumps

The Sno-Cat operates where it is really cold . . . high in the mountains . . . with U. S. Navy, French and British Expeditions in the bitter wastes of the Antarctic . . . wherever snow is so deep that wheel vehicles fail.

Like many other vehicles that must operate in cold weather, the Sno-Cat uses a Vickers Vane Pump to avoid the extra starting handicap that would be imposed by a hydraulic pump with fixed teeth or spring-extended vanes. In extremely low temperatures such a pump seriously increases starting load over normal (see curves at left) . . . at a time when the cold has substantially reduced the power of the starting battery. The diagrams below at the left show why Vickers Vane Pumps provide much easier cold weather starting.

All Tucker Sno-Cats use a Vickers hydraulic power steering system. In addition to the pump, these systems include a steering booster, a volume control, and overload relief valve.

Any vehicle which must operate in cold weather needs a hydraulic pump that provides "no-load starting". Let us tell you more about it . . . and about the many other reasons for using Vickers Balanced Vane Pumps.

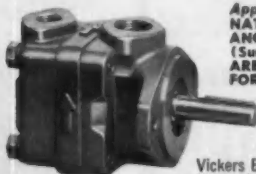
VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

ADMINISTRATIVE and ENGINEERING CENTER

Department 1428 • Detroit 32, Michigan

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Summit, N. J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA • WASHINGTON • WORCESTER
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto



Vickers Balanced Vane Type Pumps for mobile equipment are available in five basic sizes having 15 normal delivery ratings and a variety of mountings. Other advantages include: high efficiency, automatic wear compensation, hydraulic balance, dependability and long life. Write for Catalog M-5101.

AI TABLOID AI

(Continued from page 148)

Keuffel & Esser Co. is opening a new factory at Cranford, N. J.

Champion Aircraft has announced a new plane with tricycle landing gear.

* * *

General Electric Co. plans a sizable expansion of its irradiated polyethylene output.

* * *

Shin-Meiwa Industry Co., Ltd., and Vertol Aircraft Corp. have concluded an agreement for the Japanese firm to maintain and overhaul Vertol helicopters in the Far East.

Robertshaw-Fulton Controls Co. has opened a new \$2 million manufacturing plant at Milford, Conn., for its Bridgeport Thermostat Div. . . . Davidson Rubber Co. has opened a subsidiary manufacturing plant at Dover, N. H.

* * *

Goodyear Tire and Rubber Co. is now producing in quantity tubeless aircraft tires approved for Arctic operation.

* * *

Gould-National Batteries, Inc., has completed a new factory at La Puente, Calif. . . . Bristol Co. has opened a new branch factory and warehouse in Houston, Tex.

* * *

By the end of 1957, Mexico will have a helicopter assembly plant, in collaboration with French interests.

* * *

Hetherington, Inc., is building a new plant at Folcroft, Pa. . . . Servomechanisms, Inc., plans to build a new plant in eastern Nassau County, N. Y.

* * *

Cessna Aircraft Co. has won an Air Force light twin-engine plane competition for administrative liaison and light cargo planes.

* * *

Krupp Works is going to build a factory in Sao Paulo, Brazil, to produce locomotives and heavy trucks.

* * *

Bigelow-Liptak Corp. has moved its headquarters to new offices at 13300 Puritan Ave., Detroit 27, Mich. . . . Kett Tool Co. has moved to larger quarters at 5055 Madison Rd., Cincinnati, O.

* * *

Minnesota Mining and Manufacturing Co. recently made its two billionth commercial size roll of tape.

* * *

Johns-Manville Corp. will spend \$35 million on plant expansion in 1957.

* * *

Bor-O Tools, Inc., has moved to its new factory and office at 12360 Beech Road, Detroit 39, Mich.

* * *

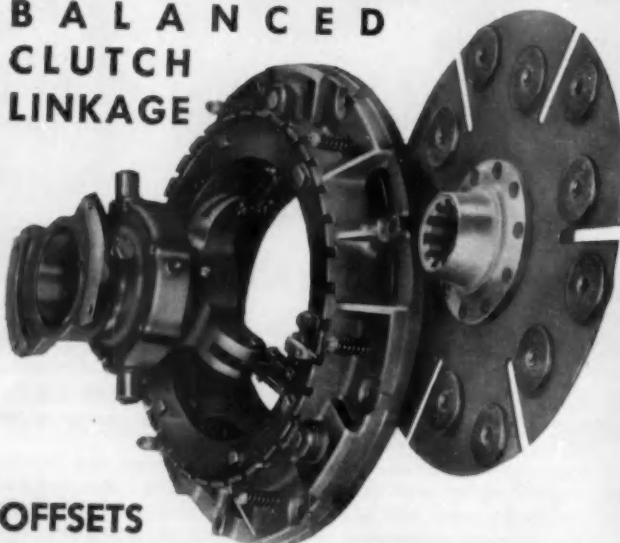
Superior Tube Co. now has in operation a 50-lb electric melting furnace for use in the development of experimental tubing analyses.

* * *

Goodyear Tire & Rubber Co. is building new district offices and warehouse buildings at Dallas, Tex., St. Louis, Mo., and Boston, Mass.

ROCKFORD

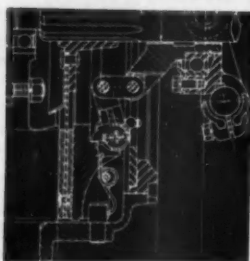
BALANCED
CLUTCH
LINKAGE



OFFSETS
CENTRIFUGAL

Disengagement of ROCKFORD Over-Center Clutches is positive. It is accomplished by a linkage arrangement which is counter-balanced to offset the effects of centrifugal force — prevalent in modern high-speed engines. Give your product this and several other advantages — by specifying a ROCKFORD clutch.

EFFECTS



Write for our latest bulletin that shows technical illustrations of ROCKFORD CLUTCHES and POWER TAKE-OFFS, with diagrams of engine applications, capacity tables, dimensions and specifications.

ROCKFORD Clutch Division BORG-WARNER

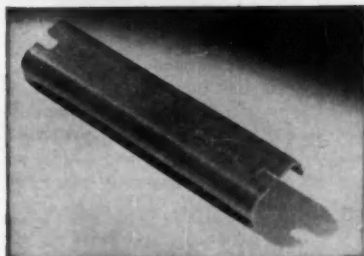
315 Catherine St., Rockford, Ill., U.S.A.
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

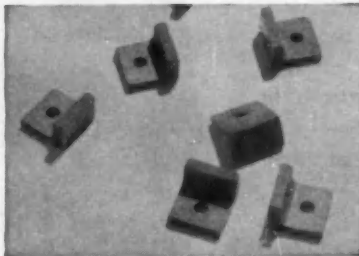


C-D-F MACHINES TO CLOSE TOLERANCES.

Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.

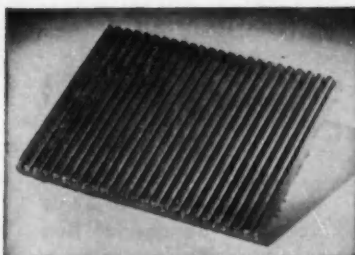


C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded tubing that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.



C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.



CONTINENTAL DIAMOND FIBRE

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 2, DELAWARE

Do you need better ways to strip paint?

When tough finishes resist your present stripping methods, you may need help on some of these problems:

- 1 How to strip oil-base paints... synthetic enamels... alkali-resistant plastics... resin-base paints... japans... wrinkle finishes... nitrocellulose lacquers... alkyds... phenolics... ureas.
- 2 How to strip zinc chromate primers without etching aluminum.
- 3 How to strip paint from vertical surfaces and undersurfaces where thin-bodied strippers run off without doing their work.
- 4 How to strip metal parts that are too large to be soaked in tanks.
- 5 How to strip paint, pigment residues, phosphate coatings and rust in one operation.
- 6 How to strip paint from rejects, conveyor chains, racks and hooks in continuous operation.

Oakite has more than a dozen fine stripping materials for these and similar jobs.

FREE For information on problems 1, 2, 3 and 4 ask for a copy of "How to STRIP PAINT". For more on problems 5 and 6 ask for "Here's the best shortcut in the field of organic finishing". Write to Oakite Products, Inc., 28A Rector St., New York 6, N. Y.



Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U.S. and Canada

Industry News

(Continued from page 94)

Ford Outlays for Research On Smog Reach Half Million

Automobile industry support of research on the Los Angeles smog problem was stressed recently by Richard E. Krafve, general manager of the Edsel Div. Mr. Krafve noted and other contaminants from automotor Co. has invested nearly \$500,000 on studies connected with smoke control.

The total includes \$325,000 spent by Ford's Engineering Research and Scientific Laboratory on studies aimed at reducing emission of hydrocarbons and other contaminants from automobile exhausts; \$90,000 for research and smoke and fume control at the new Mercury plant at Los Angeles, now under construction; nearly \$66,000 contributed to the Air Pollution Foundation; \$11,500 to Stanford Research Institute for a joint Ford-General Motors-sponsored study to determine the relationship between automotive manufacturing assembly operations and the smog problem; and \$6000 for a Stanford study at the old Mercury assembly plant in Los Angeles.

Missile-Carrying Trailers Will be Built by Fruehauf

Fruehauf Trailer Co. continues to play an active part in the Government's guided missile program. The company last month received another order for special truck-trailers designed for transporting and launching missiles.

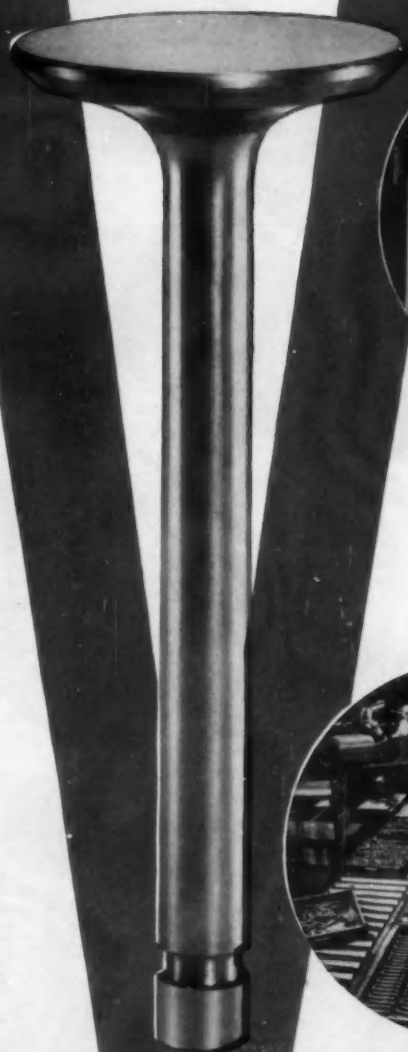
Fruehauf will build the units at its Fort Wayne, Ind., plant under a \$1 million subcontract from Goodyear Aircraft Corp. Earlier, Fruehauf received similar subcontracts from Western Electric and Douglas Aircraft.

Mexican Automobile Show Scores a Successful Run

The Second International Automobile Show, held in Mexico City early last month, was an outstanding success from every viewpoint. Organized by the Mexican Automobile Association, it drew a total of 300,000 visitors.

A total of 50 passenger cars of both U. S. and foreign manufacture were displayed, in addition to trucks, motorcycles, bicycles, and other vehicles, along with parts and accessories.

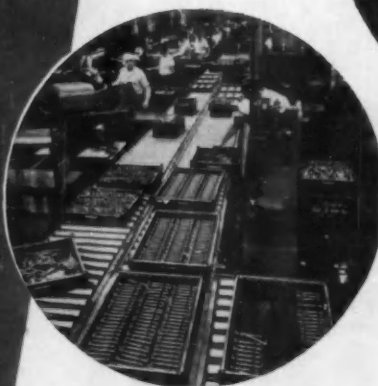
(Turn to page 156, please)



Metallurgy



Design



Production

Complete facilities for all your valve requirements at the Valve Division

More than 500,000 square feet of production and laboratory area at the new Valve Division plant are used exclusively for developing and making engine valves, seat inserts and other valve train components.

Back of these new facilities are our 50 years of experience in producing valves and valve-train parts for every car, truck, industrial and aircraft engine manufacturer.

Here is experience you can use to advantage in your new engine designs.



Valve Division *Thompson Products, Inc.*

1455 EAST 185th ST. • CLEVELAND 10, OHIO

Designed for Strength and Safety



STRENGTH AND SAFETY are built-in features of this seat-belt buckle made from Republic Stainless Steel, Type 201. Fabricating operations include: shearing into blanks of .125 thickness, punching, a severe bend of 175° to form the hook.



SAFETY ASSURED by designing the high strength advantage of stainless steel into the simple beak-type buckle. No intricate springs or mechanisms to fail at the wrong moment. Both belt and buckle are rated 1000 pounds in excess of CAA specifications.

REPUBLIC



World's Widest Range of Standard Steels

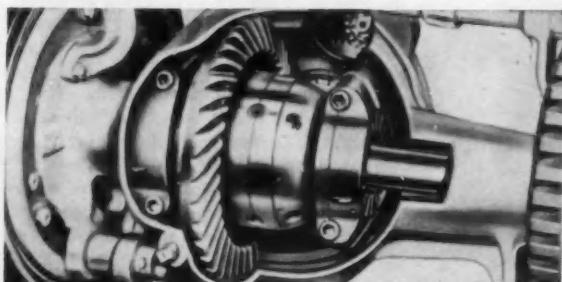
with **STAINLESS STEEL**

SEAT-BELT MANUFACTURER LICKS CRITICAL PROBLEM WITH REPUBLIC ENDURO, TYPE 201

Here are the facts on a new and cost-cutting use of Republic ENDURO® Stainless Steel, Type 201, by Bunke-Musser Company, Jackson Center, Ohio, manufacturers of safety seat-belts for the automotive industry.

The most critical part of the entire assembly is the buckle. It must conform to Associated Seat Belt Manufacturers' specifications. These require that the buckles be subjected to a test pull of 1500 lbs., then reduced to 125 lbs. At this point, the pelican hook of the buckle must be capable of release at 45 lbs. pressure.

Prior to adoption of Type 201, another grade of stainless had been used. However, the slightly softer surface of this type resulted in a galling action at the fulcrum of the buckle when the release pressure was applied.



THERE'S NO SACRIFICE OF STRENGTH OR SAFETY in this drive axle designed from Republic Alloy Steel. In these fine steels you will find the highest strength values—plus an exceptionally high strength-to-weight ratio that permits transmission of hundreds of horsepower through tough, strong axles, shafts and gears, free from excess weight. Republic Alloy Steels are essential in designing smaller sections to carry heavier loads safely—essential in extending equipment life and reducing maintenance and replacement costs. Send coupon for data.

Bunke-Musser also experimented with carbon steel. But this required use of heavier gage, chrome plating and polishing, with the end result being much more expensive than stainless steel.

Now the company has standardized on Republic, Type 201, with excellent results. The buckles meet and exceed test specifications. The galling action has been eliminated. Tensile strength increased 200 lbs.

Types 201 and 202 are relatively new members of Republic's family of stainless steels. Republic Specialists will be happy to work with you in designing these new grades into your product. The 200 Series offers high strength, corrosion-resistance and easy forming on your present equipment. And they are readily available. Mail the coupon for more information, or if you would like a Republic Specialist to call at your plant. There's no obligation.



A BUILT-IN SAFETY FACTOR is one reason why Republic Nylok Nuts are being used in thousands of critical applications to resist shock, vibration and cyclic loading. The answer is in the nylon plug in one face of the nut which forces threads on other side tight against bolt or stud. Above, Nylok Nuts provide a powerful clamp action and keep vital steering tie-rod assembly securely in adjustment. Nylok Nuts can be removed for maintenance of parts, then re-used with no loss in holding power. And because either end is up they are ideal for automatic feeding and power wrenching. Send coupon for more facts.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION

Dept. C-2865,
3106 East 45th Street • Cleveland 27, Ohio

☐ Please have a Republic Specialist call.

Send more information on:

☐ 200 Series Stainless Steel ☐ Alloy Steels ☐ Nylok Nuts

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Industry News

(Continued from page 152)

Locomotives and Satellites In Fore at AIEE Gathering

Land transportation and earth satellites were given a big play at the winter meeting of the American Institute of Electrical Engineers in New York City recently. Twelve papers were presented to the 5000 or more engineers in attendance on the

electrical aspects of new locomotives.

Much interest was shown in a 8500-hp gas turbine unit, self-propelled trains, rectifier locomotives, and a mechhydro-hydraulic transmission for lightweight trains. Two symposiums on earth satellites provided information on satellite communications and telemetering.

Locomotives using gas turbine power plants in some form, according to General Electric Co., are only at the threshold of their development. A locomotive now under construction is rated 8500-hp at 6000 ft altitude and

90 F, according to specifications.

The locomotive consists of an auxiliary and a turbine-generator unit. Fuel is carried in a tender coupled behind the turbine-generator unit. This gives constant weight on drivers, as well as the ability to carry several times the amount of fuel considered standard on other types of locomotives.

Baldwin-Lima-Hamilton Corp. pointed out some of the savings made possible by lightweight trains and locomotives. The company has designed one such locomotive using a hydraulic transmission for the New York Central and two for the New York, New Haven and Hartford.

The locomotive has been designed from "scratch," so to speak, utilizing a German Railways Maybach hydraulic transmission. It uses two Diesel engines, one for traction and the other to provide electric current for train auxiliaries.

Twelve new 3300-hp rectifier-type locomotives, being delivered to the Virginia Railway Co., are designed for low-speed, heavy freight service on a 134-mile electrified zone. Each of the road-switcher-type locomotives has a total weight of 396,000 lb and is 69½ ft long. Conversion of the 11,000-v, 25-cycle trolley current to direct current is by means of 12 Ignitron tubes.

Some of the instruments that may be shot into space in the Vanguard satellite were described at the meeting. The instruments must be limited to two to three lb to be acceptable for flight. The type of information it is hoped will be obtained by use of satellites includes observation of solar flares; cosmic rays; measurement of the earth's magnetic field; and meteorological data.

Marine Corps Equipment Tests Show Teflon Good Preservative

The versatility of Teflon as a dry lubricant and preservative for metals has been demonstrated in Marine Corps tests of weapons coated with the material. Teflon coatings were found to provide suitable protection for weapons in long-term storage despite a total lack of care. Coated equipment was ready for use as it was removed from packing.

Original coatings of Teflon afforded lubrication for small arms under all circumstances for an almost indefinite period. Firing of coated projectiles actually improved the condition of the barrels and cleanliness of firing chambers. A report of the tests has just been released to industry through the Office of Technical Services, U. S. Dept. of Commerce.



Dependable . . .
when dependability counts!

FASCO
HYDRAULIC
STOPLIGHT
SWITCHES



Fast-Action Stop! Caution Oncomers! That's the message the FASCO Stoplight Switch conveys from one driver to others . . . without fail! Over 140 million used since the adoption of hydraulic brakes . . . **PROOF** that when you design for dependability, safety and service it **PAYS** to

CONSULT FASCO . . . FIRST!

AUTOMOTIVE DIVISION



DETROIT OFFICE—12737 PURITAN—PHONE: UN 17476

Passenger cars



Trucks



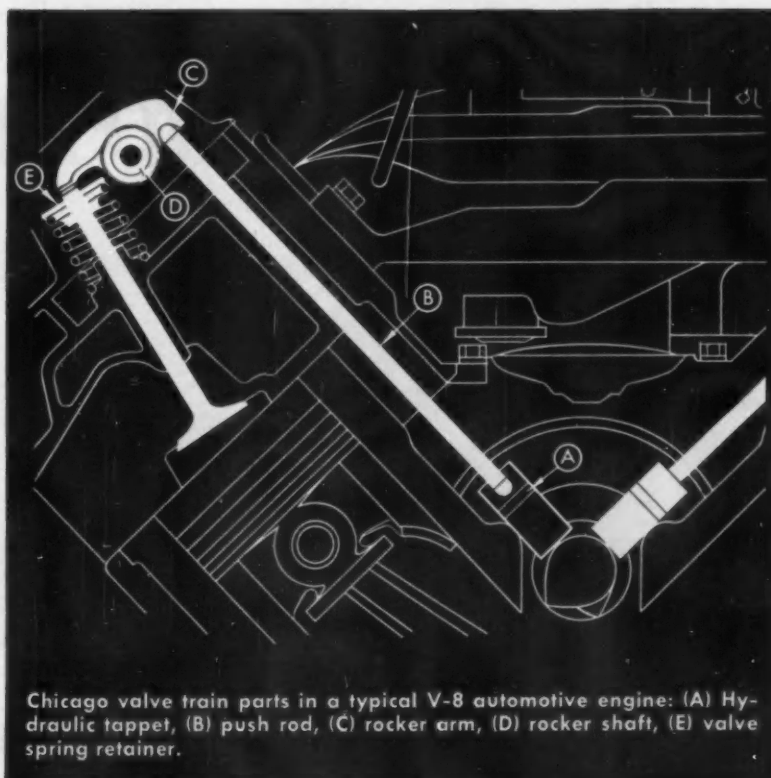
Tractors



Diesels



Aircraft



Chicago valve train parts in a typical V-8 automotive engine: (A) Hydraulic tappet, (B) push rod, (C) rocker arm, (D) rocker shaft, (E) valve spring retainer.

**When it comes to valve gear,
leading engine makers come to**

CHICAGO

Here at Chicago you'll find a single source for everything you need in valve gear. These specialized facilities are solving problems and saving money for leading engine manufacturers . . . and can do the same for you.

Design and Engineering—at Chicago you'll find valve gear engineering experience in depth . . . men who understand your problems and will work with your engineering staff in designing cam shafts and complete valve gear assemblies for any type of engine.

Manufacturing—Chicago is a leading manufacturer of valve train parts. Our complete line includes precision-made hydraulic and mechanical tappets; push rods in both lightweight tubular and solid styles; valve adjusting screws including new self-locking screws that cut assembly costs; valve spring retainers; rocker arms and rocker shafts.

Testing—we have complete laboratory and engine testing facilities.

For the full story of how we can serve you, write our Tappet Division.

THE CHICAGO SCREW COMPANY

DIVISION OF STANDARD SCREW COMPANY • ESTABLISHED 1872

2801 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

IN TORTUOUS ALCOA TEST

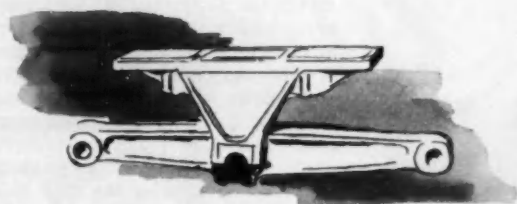
...twenty-two tons hit a



railroad tie and WHAM!

There's a new way to soak up the shock when a truck hits a chuckhole in the road—or on a test run. The Hendrickson tandem splits the jolt, cuts road shock in half.

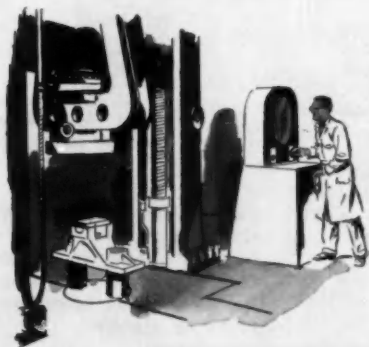
The key parts of the axle, the beam and saddle, take a terrific pounding. Formerly made of steel, Hendrickson came to Alcoa® to see if the



beam and saddle could be made of aluminum to reduce all that unsprung weight. Our Development Division went to work.

To determine the strength of the original steel parts they were tested to destruction on a 400,000-lb Baldwin-Southwark test machine. Then, after carefully analyzing the data, Alcoa redesigned the beam and saddle in a strong, lightweight aluminum alloy. The parts weighed only half as much as the steel beam and saddle.

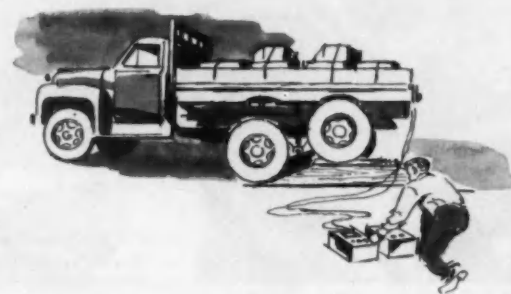
At this point the job was half done. Next the parts were fatigue-tested with alternating stress-



es at double the actual service loads. The designs withstood 10 million cycles of this punishment.

Next the saddles were crushed in the jaws of a giant compression testing machine. The average rupture strength of the saddles was more than 365,000 lbs, far more than any loads ever encountered in actual service.


Then came the toughest tests of all. Aluminum beams and saddles were installed on a tandem truck which was overloaded with 45,000 lbs. Aluminum parts were painted with brittle lacquer Stresscoat to indicate strains. Strain gages were used to check stresses. In the actual test the truck was driven over a railroad tie, through



a 10-inch-deep chuckhole, over a 12-inch ramp.

The strain detection data proved conclusively that the aluminum beam and saddle had more than enough strength to withstand the jolts and stresses of actual service. These beams and saddles have now successfully completed hundreds of thousands of miles of actual service.

This development is typical of the kind of assistance Alcoa gives to manufacturers who want to take advantage of aluminum's light weight, high strength and excellent corrosion resistance. Let our Development Division work with you on the goals you've set for your new models. Aluminum Company of America, 1841-B Alcoa Building, Pittsburgh 19, Pa.

ALCOA  **ALUMINUM** gives every 1957 car more **GLEAM AND GO**

Trends in Valve Gear Design

By Carl Voorhies, Norman Felbinger and G. R. Bouwkamp
The Chicago Screw Co. Div., Standard Screw Co.

THE development of the Diesel engine toward higher speeds and power output has increased the requirements of the valve gear. This must of necessity be accompanied by a trend in valve gear design to compensate for the greater demands that are imposed on the valve gear parts.

In the larger size engines, the situation is further complicated by the greater mass of these moving parts.

One problem, caused by increased engine speed, is false motion which occurs when the speed of the engine becomes such that the valve spring is unable to exert the force required to

prevent separation of the valve gear parts. Excessive false motion may result in breakage of parts, pounding in of valve seats, stretching of the valve stem, dishing of the valve head, tappet and cam failures. The speed at which this false motion will occur is a function of the cam design, valve spring design, and the mass, rigidity and natural frequency of the valve gear. Excessive false motion must be avoided if satisfactory operation is to be achieved and allowances in design must be made for the maximum speed to which the engine will turn. This maximum speed should include any over-speed in installations where it is likely to occur.

GOSHEN SPECIFICATION COMPOUNDS

*outstanding product advantages can be yours
with elastomers custom-developed by*

Goshen Rubber



If it takes special compounding of natural, synthetic or silicone rubbers to develop the right combination of properties required by your part, depend on Goshen Rubber. Here you benefit from extensive knowledge gained in fabricating parts and compounding materials to meet MIL, AMS, SAE, ASTM and industrial specifications. Important recent Goshen developments include:

GORSIL silicone rubbers having same shrinkage as organic rubbers . . . useful over a temperature range of -80°F to $+500^{\circ}\text{F}$. Dimensions and tolerances of AN, MS, SAE, JIC and NAS met consistently with standard tooling, and GORSYN, synthetic rubber compounds (not silicones) withstanding temperature ranges of -65°F to $+300^{\circ}\text{F}$, and -20°F to $+400^{\circ}\text{F}$. We'll gladly review and quote on your requirements, in confidence and without obligation.

SEND FOR BROCHURE

This 8-page brochure, in handy file folder form, tells how you can put Goshen Rubber to work for you. Send for your free copy today!



See our catalog in Sweet's Product Design File.



PUT *Goshen Rubber* TO WORK FOR YOU

GOSHEN RUBBER CO., INC. 2727 S. TENTH ST. GOSHEN, IND.

Valve Spring

The valve spring's function is to supply the force required to counteract the inertia forces tending to separate the parts of the valve gear. Within the limitations of diameter and length, it is necessary to design a spring that will provide the proper load when it is required during the cycle. This must be accomplished without overstressing the steel which may cause load loss or breakage. Also the natural frequency of the valve spring should be taken into considera-

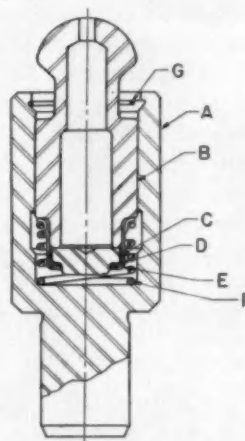
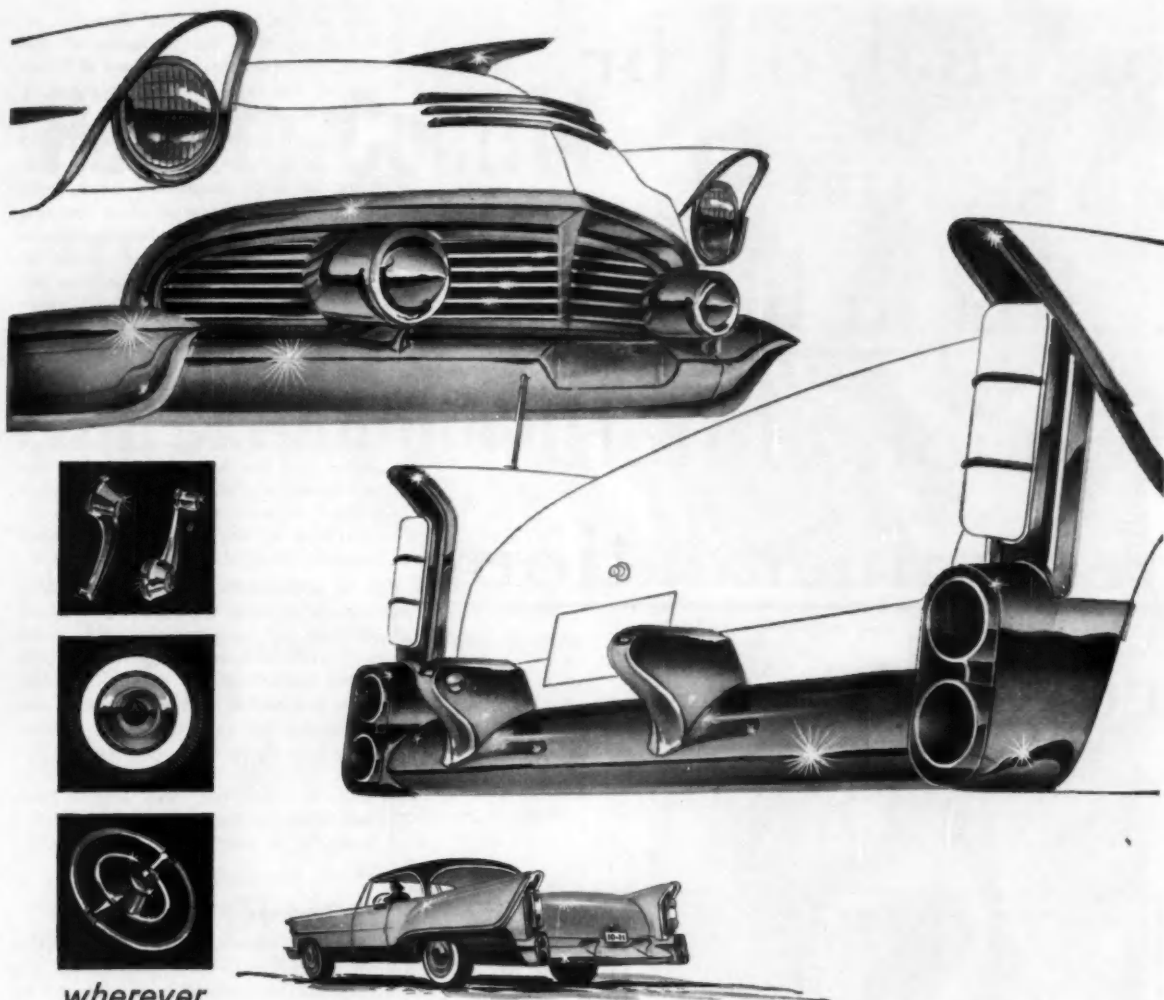


Fig. 1 — Cross-section of hydraulic lash adjuster. See text for names of components

tion and should be more than ten times the maximum camshaft rpm in order to obviate excessive spring surge and false motion. This frequency for steel coil springs can be expressed by the following equation:

$$\text{Frequency (vib/min.)} = 0.531 R \frac{D}{d^3}$$

Where R is the rate in lb/in., D is the mean diameter of the spring in inches and d is the diameter of the wire in inches. Through the relation-



wherever
you
add
trim...

THEY'LL PREFER STAINLESS!

it's a metal they know!

Sporting goods, jewelry, appliances, fine cutlery — yes, even the car they're trading in — all these things have shown them the strength, beauty, permanence, and remarkable cleanability of stainless steel.

You'll like stainless, too. It needs no protective coating. It helps simplify production and increases design flexibility through an unmatched combination of advantages — beauty (complemented by a wide variety of finishes), fabricating ease, remarkable structural strength, and great resistance to all weather conditions.

Let a Crucible engineer show you how stainless steel pays its way. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

manual, oil or air-actuated ...for unbiased* friction clutch recommendations, consult Twin Disc!



Manually-Actuated



Oil-Actuated



Air-Actuated

*Unbiased recommendations... because whether your operation calls for a manual, oil-, or air-actuated clutch, all are available from Twin Disc. More important, Twin Disc also makes a complete line of fluid drives, including torque converters—both single-stage and three-stage—for applications from 30 to 1000 hp... as well as fluid couplings for engines and motors from 3/4 to 850 hp. For every industrial power transmission requirement—friction or fluid—consult Twin Disc Specialists.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois
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ship of the rate to the diameter of the spring and the diameter of the wire, the frequency becomes a function of the rate and will increase or decrease along with the rate.

In some cases it has been found that valve springs with higher frequencies than necessary have been used. The high rate of these springs, coupled with the fact that adequate spring load must be maintained at the point of inflection of the cam, results in higher than required valve open spring loads. This may lead to excessively high contact stresses between the nose of the cam and tappet. Under these conditions the valve open load and rubbing velocity may be such that metal-to-metal contact may occur and the temperature of a flat or spherical face tappet may reach 1350 F or more which will change the hardness of the surface of a steel tappet.

In cases where this condition exists, the valve open spring load must be reduced or a material found which will withstand such temperatures with little metallurgical change. Chilled iron is probably the best common material for this condition, with hardenable iron in between steel and chilled iron, but since other types of failure may be occurring, only engine tests will furnish the answer as to which material is best.

Hydraulic Lash Adjusters

Fig. 1 shows a typical installation of a hydraulic unit mounted on the top end of the push rod with the oil fed to the unit from the rocker arm. The assembly is composed of the body or cylinder A, a plunger B, check valve C, valve spring D, check valve retainer E, plunger spring F and snap ring G. Oil is supplied to the unit from the rockerarm through the hole in the top of the plunger and fills the reservoir in the plunger.

Fig. 2 shows a variation of the pushrod mounted hydraulic unit in which a provision is made for compression release. This unit is used in the Caterpillar 5 1/2 in. bore engines which are installed in several models of their tractors. Rotation of the cam 1 holds the intake valve open for starting. The adjustment shown at 2 adjusts the position of the flange relative to the cam for the proper opening of the valve for compression release. After this position is determined, the adjusting screw 3 is used to set the travel of the hydraulic unit. This is an initial adjustment for taking care of manufacturing variations. No further adjustment is necessary since the hydraulic unit has sufficient travel to

How to Control Corrosion on Bare Aluminum

Corrosion is a real threat to aluminum, especially to the higher strength alloys. It can be controlled by using a chemical surface treatment, with results as dramatically effective as those shown in the illustrations at the right.

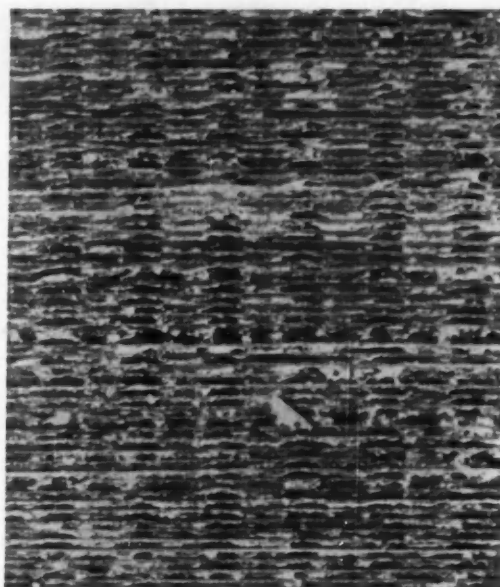
The corrosion protection is effected by Bonderite 710 or 720, applied by spray, immersion, or brush-on methods. A thin, iridescent coating, light to golden brown depending on the alloy treated, covers all surfaces of the aluminum and protects it against corrosion.

The coating produced by Bonderite is integral with the metal itself. It is flexible and can withstand moderate draws without difficulty. Arc and spot welding fabrication methods need not be changed, because the coating conducts electricity. It has good resistance to bimetallic and galvanic corrosion. Sheets, castings, forgings, extruded and rolled structural forms may be treated.

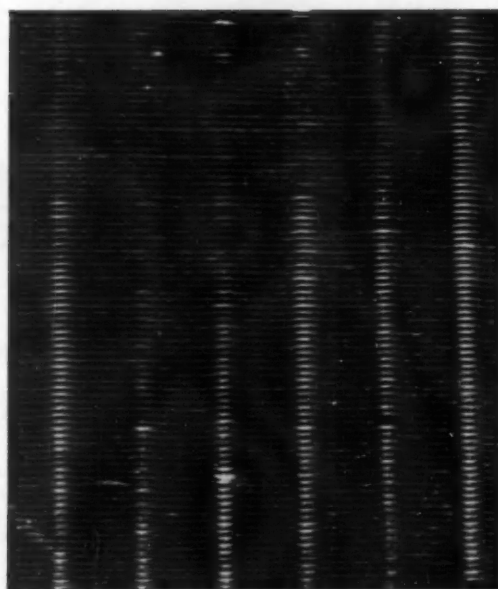
Bonderite 710 and 720 solutions are sludgeless, easily controlled, uniform in results.

These treatments may be used to increase the durability of paint finishes with equally outstanding effectiveness.

The Parker man in your territory has valuable experience to share with you in treating aluminum and its alloys. A letter or phone call will bring him to you.



UNTREATED—Unretouched photo of section of aluminum heat exchanger after 1150 hours in salt spray. Note corrosion.



BONDERITE-TREATED—Unretouched photo of section of identical aluminum heat exchanger after 1150 hours in salt spray. Note absence of corrosion.

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paints since 1883

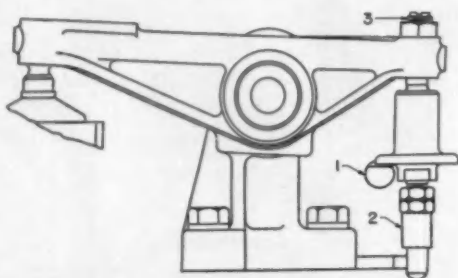


Fig. 2—Pushrod-mounted hydraulic lash adjuster with provision for compression release

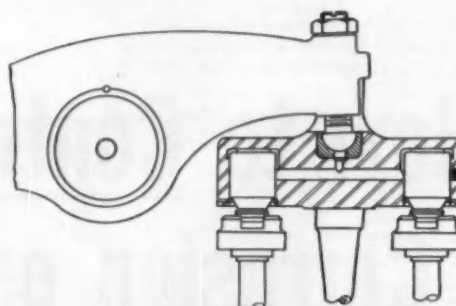
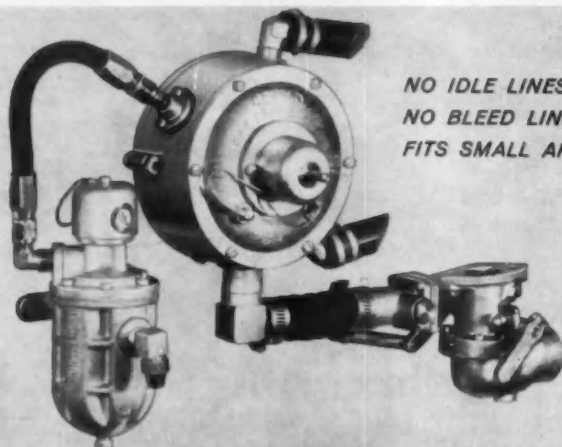


Fig. 3—Hydraulic lash adjuster application with two valves operated by one rockerarm

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COMPACT DESIGN and lightness are engineered into years-ahead Century LP-Gas carburetion. Their small size and simplicity make Century units easy to install and service, even in confined areas.

Century 3C Carburetors with exclusive metering valve "controlled combustion" guarantee perfect fuel-air mixtures for instant starting, perfect idling and full power.

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Century's engineered simplicity means top performance with greater fuel economy. Write for complete information.

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Demand the dependability of
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carburetion



compensate for any changes due to wear or temperature variations.

Fig. 3 shows an installation in which one rockerarm, having one adjusting screw, operates two valves. Since a hydraulic unit is located over each of the valve stems, compensation is independent for each valve and the adjusting screw need only be set to the approximate position. Also, it is not necessary to keep the end of the valve stems the exact same height above the head. The oil is fed to the unit through the rockerarm and the "T" or bridge.

The foregoing is an abstract of a paper presented by the authors at the Annual Meeting of the Society of Automotive Engineers held in Detroit last month.

BOOKS...

MOTOR CARS TODAY, by H. E. Mclburn, published by Oxford University Press, 114 Fifth Avenue, New York 11, N. Y. Price, \$3.50. This book, written by a British engineer, is an extensive treatise on the modern automobile which takes most of its examples from British and continental models. It treats of the construction and operation of all the principal parts, including the engine, the carburetor, lubrication system, transmission, brakes, steering, and suspension system. Although it is written for the layman, the American specialist may find this work useful for the light it throws on the many new developments taking place in the British automobile industry today.

MECHANISMS AND DYNAMICS OF MACHINERY, by H. H. Mabie and F. W. Ocvirk, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$8.50. Although this book is intended primarily as a college textbook, the authors have streamlined their coverage of elementary subject matter. As a result, they have been able to devote more space to the discussion of more advanced topics, such as analytical cam design, non-standard gearing, computing mechanisms, synthesis, and dynamic analysis of rotating and reciprocating machinery. Many examples are included, and a generous sampling of problems is offered.

7

Big Advantages!

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WAGNER PRECISION AUTOMATIC

INCREASED LOAD CAPACITY

PRACTICAL FLEXIBILITY

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IMPROVED PLATING QUALITY

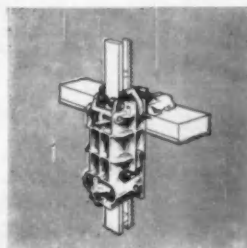
This modular precision electroplating machine is a big subject. Please send for our technical bulletin, learn all the facts, compare—or call the Wagner Man in your area. He'll study your problems and help you achieve better plating at lower costs.

This 113' pre-enameling machine was dry cycling four days after delivery. Capacity 100 100-lb. racks per hour. Overall height of lift only 13'.

Any day of the week you'll see us lift a 3200 pound automobile with the elevating mechanism of our standard automatic plating machine. That's just to dramatize the dynamic lift capacity of our modular type machine. This excessive capacity simply means that deflection under normal loads is minimum, thus strain on alignment mechanisms is eliminated, wear and downtime is reduced to the vanishing point. Your own personnel—any mechanic—can make precision adjustments of critical transfer members, including the main lift boom, carrier lift angle assemblies and carrier rail support brackets. Maintenance is simple as standard gear racks and pinions are used throughout the entire elevator mechanism (altho capacity can be increased 50% by substituting our heavy duty rack). Hardened guide rollers have positive lubrication—or central lubrication may be installed at low cost.

Here's how you get low cost installation and servicing, even later alterations. All details are interchangeable, precision drilled and machined, preassembled. Our modular design permits easy lengthening or shortening for long term production changes; parts, assemblies, even sections may be replaced. Every part is drilled, reamed, tapped and milled in special co-ordinated fixtures; sections are assembled in giant jigs for fool-proof self-aligning. A single hydraulic power unit interconnected to two hydromotors with micro adjustment of acceleration and deceleration permits work carriers to be lifted, transferred and deposited gently without jarring or loss of parts.

Typical pre-assembled single station elevator housing ready for bolting through jig-drilled holes in main carriage. Note adjustable roller guide brackets.



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CHICAGO • CINCINNATI • CLEVELAND • INDIANAPOLIS • NEW YORK • ROCHESTER • GRAND RAPIDS

Wagner
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Whatever your furnace needs for control—

There's good reason why more heat-treating furnaces everywhere are controlled by Brown instruments. First, of course, is performance . . . sensitive, precise control that meets the most exacting requirements of modern heat-treating techniques. And equally important is versatility. In this varied line of instrumentation you'll find just about everything a furnace could possibly need in the way of control.

Choose **ElectroniK Strip Chart Controllers** for detailed, long-term records . . . and a selection of control forms including electric systems of the contact, position-proportioning (*Electr-O-Line*) and time-proportioning (*Electr-O-Pulse*) types; and pneumatic control from two-position to full proportional-plus-reset-plus-rate action.



position-proportioning (*Electr-O-Line*) and time-proportioning (*Electr-O-Pulse*) types; and pneumatic control from two-position to full proportional-plus-reset-plus-rate action.

Choose **ElectroniK Circular Chart Controllers** for ease of scale reading . . . convenient daily charts; in a full range of electric and pneumatic control forms.



Note: the basic components of all **ElectroniK** models are interchangeable . . . to simplify and speed up service.

Choose **ElectroniK Circular Scale Controllers** where you want readability and control check at extreme distance . . . without need for a record. Supplied with all contact and proportional types of electric control.



Note: all **ElectroniK** models are available in both Standard and Precision Series.

Choose **Pyr-O-Vane Controllers** where you don't need a record but do need precise vane type snap action electric control by a millivoltmeter instrument . . . also available with pulse-type time proportioning action, in both vertical and horizontal models.



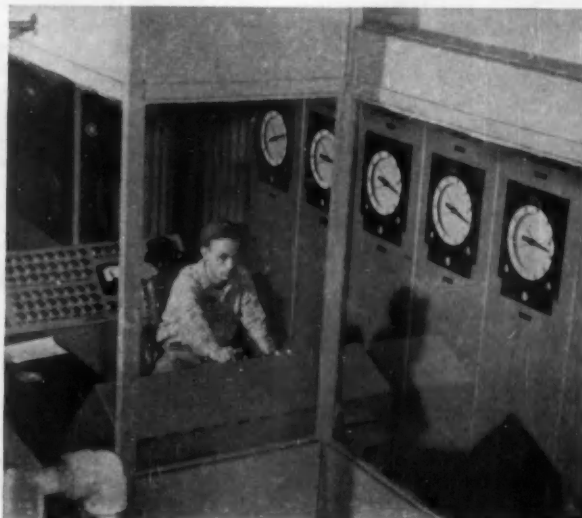
Choose the **Protect-O-Vane Safety Cut-Off** for simple, dependable excess temperature protection . . . can be used with any temperature control to prevent furnace shut downs and loss of production.



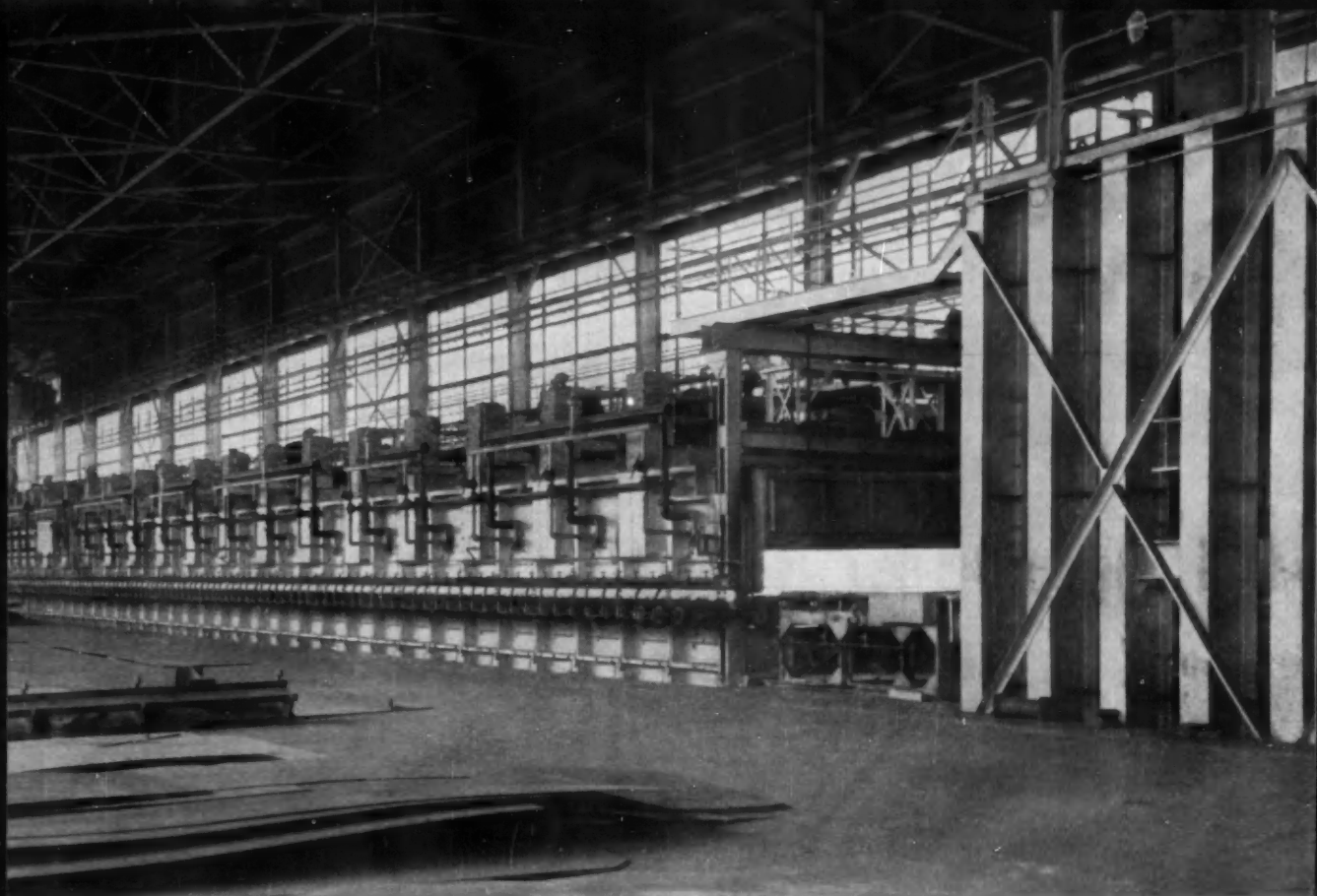
And . . . for all your pyrometer supplies, investigate the convenience and economy advantages of the HSM Plan.

354 feet from loading end to quench press, this continuous heat-treating line at Lukens Steel Co. processes wide steel plate quicker, more economically than ever before. Feature of the line is a Drever furnace, controlled by **ElectroniK Air-O-Line** instruments.

130" steel plate heat treated to close temperature



In the control pulpit, the operator can watch each zone temperature . . . clearly displayed on the circular chart **ElectroniK** controllers on the instrument panel.



limits in Lukens' new 202' furnace

STAINLESS steel plate up to 130 inches wide, 1 inch thick and 40 feet long is heat treated in a new line now operating at Lukens Steel Company, Coatesville, Pa. Designed by the Drever Co., Philadelphia, the line—longer than a football field—handles austenitic stainless alloy plates.

To handle the work that Lukens produces, the furnace was designed for accurate, flexible temperature control. 90 Bloom burners, firing either natural gas or No. 2 oil, supply heat under control of a battery of *ElectroniK* instruments. Through their *Air-O-Line* pneumatic control systems, these instruments regulate heat input to each furnace zone. They hold temperatures at the values set by the operator . . . throughout working ranges between 900 and 2000°F.

Close temperature control of this big furnace is the

result of good furnace design . . . and top performance by instrumentation. It's the kind of job for which *ElectroniK* controllers have been chosen in thousands of metalworking and metal producing plants for more than a decade. Whether you're planning new equipment or modernizing, be sure that you select *ElectroniK* instrumentation . . . to be sure of the best in controls, made by the world's largest manufacturer of controls.

Let's talk over your specific control problems. Just call your local Honeywell field engineer . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA:** Write for Catalog 1531, "*ElectroniK Controllers*" and for Price List 56-1, "*Furnace and Oven Controls*."



MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

MOTOR BOAT SHOW

(Continued from page 56)

starter cord is pulled, thereby reducing cylinder compression 40 per cent during cranking. Normal compression is restored as soon as the motor starts.

Gale

New styling in its Buccaneer line of 3 to 25 hp models along with certain "quitting" features are among

the noteworthy changes this year. Units have underwater and relief exhaust mufflers plus two-stage carburetor intake muffling. The powerhead is sound insulated and rubber mounted.

Johnson Motors

Featured improvements in its 3 to 35 hp Sea-Horses include a slip clutch on the propeller, automotive generator, and easier manual starting for both the large and small models. The larger models have a compression relief chamber while the others utilize a large-diameter oval pulley. The 35

hp units have a displacement of 40.5 cu in., an increase of five cubic inches over last year's 30 hp model. The slip clutch consists of a flexible hub core of compressed rubber, sealed in the propeller. All models have a fish line cutter to protect the propeller shaft.

Kiekhaefer Corp.

New in the Mercury line is a six-cylinder model rated at 60 hp with a 59.4 cu in. displacement.

Oliver

The outboard motor division of the Oliver Corp. showed three new models of 35, 16, and 6 hp. The largest model features automotive-type poppet valves, a special motor angle adjustment, and a 12 v electrical system with a generator, battery, and four field starter.

Scott-Atwater

A luxury engine is a feature of the line this year. It's a 40-hp unit with turn-key starting, electrical fuel pump, 12-v electrical system, automatic bailer, remote control connections, and even a personalized name plate in which the owner's name is engraved. A speed control dial on the powerhead replaces the usual twist grip handle. The carburetor uses a two-jet system, cutting in the second jet when at wide open throttle. The model line runs from 3.6 hp up to the 40 hp Royal Scott.

West Bend

The smallest motor at the show, a two-horsepower model called the Shrimp, is the newest item in the line this year. It's aircooled, weighs 29 lb, has a displacement of 3.76 cu in., pivots 360 deg, and is said to run two hours on seven pints of fuel at top speed. On the large electric starting models, West Bend is using a magneto-generator combination.

• • •

Many New Car Instruments Under Study By AC Div.

AC Spark Plug Div. of General Motors has some interesting development work underway on automotive instruments. One is an electrical speedometer which is not yet adapted for automotive use but which undoubtedly will be perfected before too long. AC also is working on instrumentation to show engine oil supply, water level, and battery charge level. Another interesting activity is development of smaller automotive instruments but with improved angular indicators for easy reading.

COMPACT

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DURABLE

QUIET

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POWER TAKE-OFFS

A complete line of low speed, medium speed, high speed, reversible, and three series of two speeds forward, reversible models for every truck requirement.

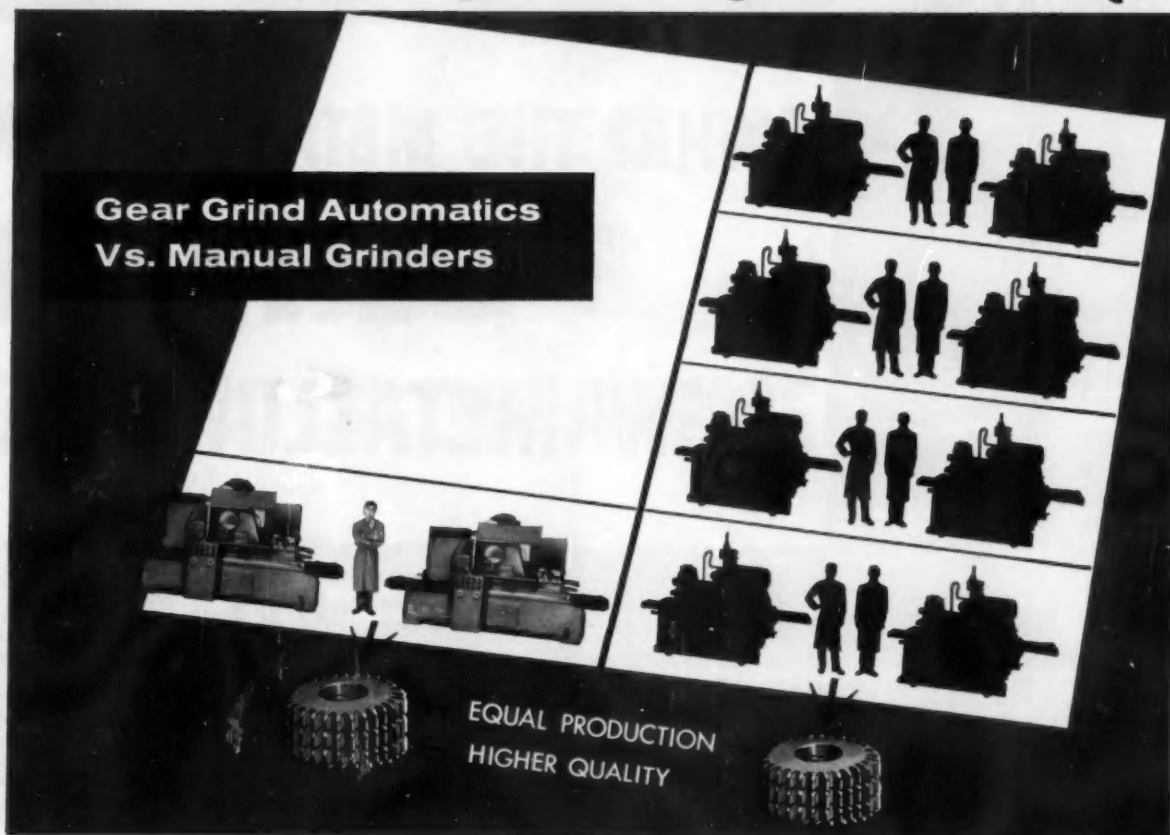
FEATURING: strong, light-weight housings; forged, heat-treated gears; heat-treated shifter yokes; anti-friction bearings throughout, shaved gear teeth; double-lip shifter shaft seals, extremely low prices, nationwide distribution and service.

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Gear Grind Automatics Vs. Manual Grinders



**2 Automatics with 1 Operator Equals
8 Manuals with 8 Skilled Operators**

$\frac{1}{4}$ the floor space
 $\frac{1}{4}$ the number of machines
 $\frac{1}{8}$ the manpower

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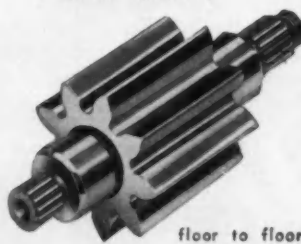
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PUMP GEAR



floor to floor
grinding cycle—
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Manufacturers of:

The Detroit Screwmatic 750, Automatic Screw Machine.
RZEPPA ("Sheppa") Constant Velocity Universal Joints

An aerial photograph of a large industrial building with a prominent central entrance. The building has multiple stories and many windows. A large white rectangular box is superimposed over the upper half of the image, containing the title text. The building's name, 'CARBOLOY', is visible on the facade above the entrance.

WHAT THE METALWORKING GENERAL NEW METALLURGICAL

CARBOLOY

Headquarters of the Metallurgical Products Department of General Electric Company, 11151 E. 8 Mile Ave., Detroit 32, Michigan. CarboLOY Cemented Oxide and carbides are made here. G-E permanent magnets and specialty resistors are manufactured in the Edmore, Mich., plant.



INDUSTRY CAN EXPECT FROM ELECTRIC'S PRODUCTS DEPARTMENT

**The new G-E Metallurgical Products Department
is the successor to the Carboloy Department.
Here's what this change will mean for you.**

Since 1928, the General Electric trademark "Carboloy" has been identified with a brand of cemented carbide. But today, Carboloy® cemented carbides are just one of a broad range of products which bear the famous Carboloy trademark.

Cemented Oxide, the Machinability Computer, toolholders, diamond dressers, drawing and forming dies . . . these are on the market today. Tomorrow, you will see many other new-product developments for the Metalworking Industry.

With carbides like the new Extra-Performance Series 300 steel-cutting grades, these products are being made available to you through a distribution team which is unmatched in the carbide industry from the standpoint of inventory, delivery, and service.

In addition, the Metallurgical Products Department makes other

products which carry only the General Electric trademark: permanent magnets, vacuum-melted alloys, hevimet, thermistors, and Thyrite® varistors. And on the industrial horizon are G-E man-made diamonds.

Thus, the new departmental name symbolizes the broadened scope of this Department's activities. Equally important, it indicates how vitally interested General Electric is in the Metalworking Industry.

Many of the products listed above are the result of fundamental investigations carried out at the G-E Research Laboratory in Schenectady. Many new developments in machining, forming, and drawing techniques are the work of G-E Engineers. And, when new products and methods are developed for the Metalworking Industry by General Electric, they, too, will come to you from the Metallurgical Products Department.

Progress Is Our Most Important Product

GENERAL  ELECTRIC



-check with **FAIRFIELD!**

How long will it take and how much will it cost?—These are points to check whenever you face the problem of setting up production facilities for gears. Special or unusual requirements in design, size, finish, tolerances, materials, and heat treatment are often "standard" at FAIRFIELD.

As one of America's largest independent producers of gears and differentials, Fairfield has every facility needed for quantity production of gears to meet virtually any need. One of the big advantages, *when YOUR GEARS are made at Fairfield*, is that you get the benefits of high production rates and big volume output on all types and sizes of gears. *Your inquiry will receive prompt attention.*

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Fine Gears and **FAIRFIELD** *Differentials for:*
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MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

AIRBRIEFS

(Continued from page 96)

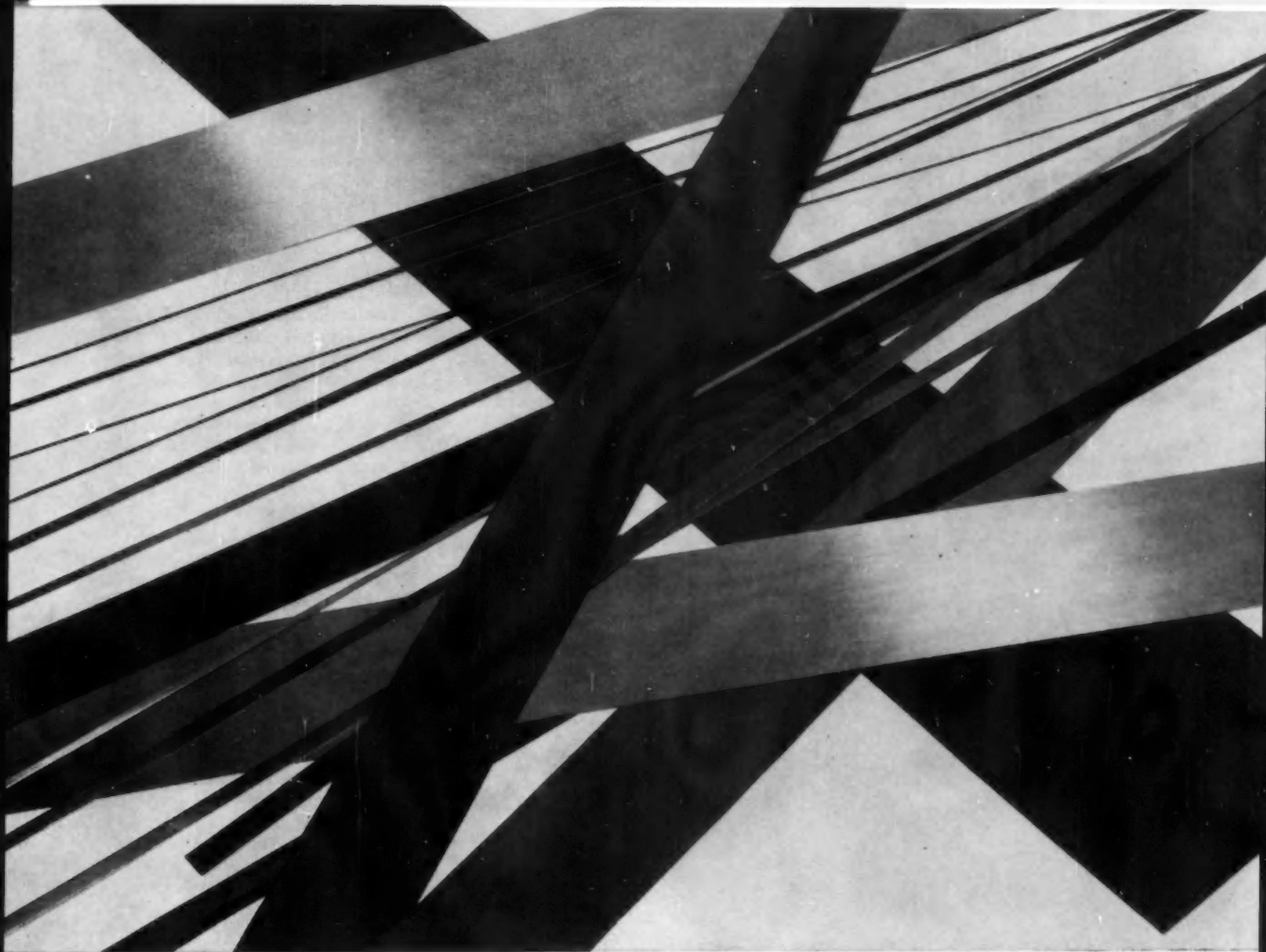
Bureau. (Robert M. Losey Award "In recognition of outstanding contributions to the science of meteorology as applied to aeronautics.") Clarence L. Johnson, Vice President-Engineering and Research, Lockheed Aircraft Corp. (Sylvanus A. Reed Award "For design and rapid development of high performance subsonic and supersonic aircraft.") George F. Jude, Director, Flight Control Engineering, Sperry Gyroscope Co. (Lawrence A. Sperry Award "For significant contribution to the advancement of precision automatic flight control and safe all-weather flight.") Ross McFarland, Associate Professor of Industrial Hygiene, Harvard University. (John J. Jeffries Award "For outstanding contributions to the advancement of aeronautics through medical research.")

The fifth top IAS annual award perpetuates the memory of Octave Chanute and is given for notable contribution made by a pilot to the aeronautical sciences. It was presented last summer to A. M. Johnson, Chief of Flight Test, Boeing Airplane Co.

During the four day meetings, January 28 to 31, a total of 96 technical papers were presented at the 26 sessions. More than 2400 engineers and scientists attended to hear the latest reports on technical developments and progress in aviation.

New Cockpit Instrument Display Proposed

Rear Admiral Louis de Florez, USN (ret'd), proposed a radically new and unique method to display aircraft instrument readings to pilots. He was guest speaker at luncheon meeting of the Institute of the Aeronautical Sciences on January 31. To relieve the pilot of the fatiguing chore of interpreting so many different dials and numbers of aircraft instruments presently installed in the cockpit of an airplane, Admiral de Florez suggests a remote indicator of great simplicity. Instruments such as air speed, altitude, oil temperature, oil pressure, manifold pressure, etc., would be connected to a panel containing a corresponding number of short-line indicators. When master controlled to indicate conditions for cruising flight the panel would show all indications to make a straight horizontal line. In case any instrument detected a non-conformance to conditions appropriate for cruising



How these "educated" steels make products behave better

● Nobody will deny that there can be a vast difference between steels that are supposedly alike. The difference lies in "tremendous trifles" that often make all the difference between smooth and erratic fabrication or between satisfactory and faulty product behavior.

That's why the steels shown above are "educated", you might say—educated for special use. Because here at the *Athenia Steel Division* of National-Standard we've concentrated for years on learning about and *controlling*

those tremendous trifles! In turn, this learning and experience is put right into the Athenia steels that successfully meet many of the toughest assignments known today.

If your production calls for cold rolled flat steels of .45 carbon or higher, from .015" to 16" wide and from .001" to .065" thick, it would be a good idea to explore Athenia quality, performance and service.

NATIONAL



STANDARD

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; fire wire, stainless, music spring and plated wires • WORCESTER WIRE WORKS, Worcester, Mass.; high and low carbon specialty wires
WAGNER LITHO MACHINERY, Secaucus, N. J.; metal decorating equipment • ATHENIA STEEL, CUREN, N. J.; flat, high carbon spring steels • REYNOLDS WIRE, Dixon, Ill.; industrial wire cloth

speed, its corresponding short-line bar on the indicator would move vertically out-of-line from the horizontal and could be immediately detected by the pilot. Thus he only has to note the one indicating a "difference from normal" rather than periodically scan with his eye all the instruments in the cockpit. Similarly, indications would be master controlled to provide for take-off conditions, climbing flight to altitude, approach for landing and for landing.

It occurs to us that such an instrument display method could be used to great advantage in testing labora-

tories, power stations, control systems, automobile panels and even for the new electronic computers. Possibly here is an idea worth serious consideration in this ever-growing life of automation.

Air Force Orders Supersonic Jets

The U. S. Air Force has awarded Convair Division of General Dynamics Corp. a \$70,200,000 contract for an undisclosed number of F-106A delta-wing, all-weather jet interceptors and supporting equipment.

This is the second F-106A production contract awarded to Convair by the Air Material Command. Last summer an initial \$83 million contract for the advanced supersonic interceptor was disclosed. The contract subsequently was amended to include additional aircraft, making the total committed for F-106A aircraft to that point \$146 million.

The new plane is equipped with the most advanced electronic fire control system and armament yet developed for an Air Force interceptor. It is capable of flight to stratospheric altitudes and of ferreting out and destroying enemy aircraft in any kind of weather, day or night.

The F-106A will be produced at Convair's Plant II in San Diego, Calif., where the F-102A—the Air Force's first all-weather supersonic jet interceptor—is in volume production for squadrons of the Continental Air Defense Command.

Add Small Airfields To Roadbuilding Program

It has been proposed by Roscoe Turner, pioneer aviator and chairman of the American Legion's Aeronautics Committee, that part of the money in the multi-billion dollar federal-state road building program be used to construct small airfields or flight strips adjacent to the new highways.

By providing flight strips about 2000 ft long by 150 ft wide, many urban areas could be made accessible by air at very little cost. Integrating such an activity with the roadbuilding program would permit economies in use of equipment, procuring the land, labor and many other items which would be on the spot and required for both the road building and the airfield.

Such landing strips could be used for general aviation purposes, emergency use for commercial airlines, in civil defense emergency and for urban inter-city air traffic.


Getman One-Man Truck Made for Variety of Operations

Getman Bros. of South Haven, Mich., has developed and put on the market a new small truck for inside, outside, and underground work. Powered by a Wisconsin gasoline or Deutz aircooled Diesel engine, the one-man vehicle can carry loads up to 3500 lb. Drive wheels are located directly under the load, and the Scoot-Crete reportedly can climb grades up to 25 deg.

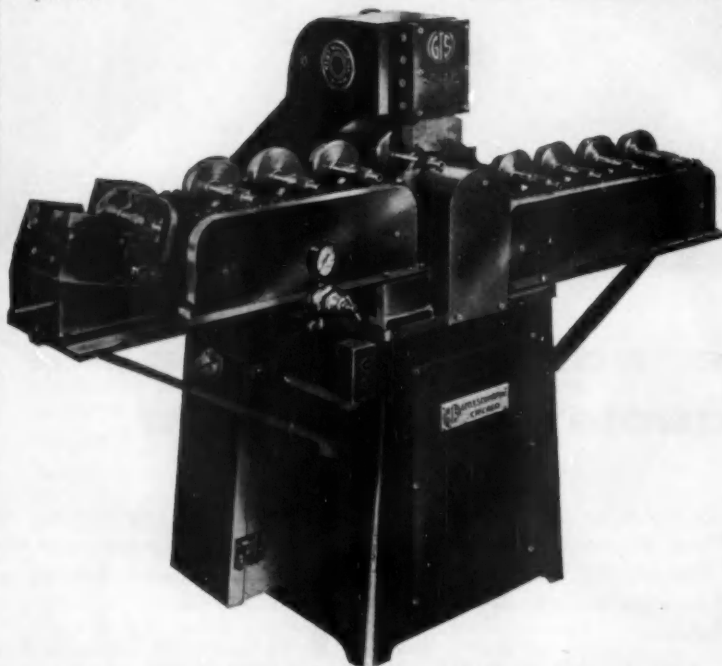
PINION GEAR MARKING?




Model 395

This fully automatic  unit marks code numbers on pinion gears—uniformly and accurately—at a production rate of 900 per hour.

DOES IT
ECONOMICALLY
... AUTOMATICALLY



The gears are fed to the spider by means of a chain feed, which carries them under a concave lettering tool. A pneumatic cushion is provided in the die holder to accommodate variations in diameter, insuring uniform depth of marking within both high and low tolerance limits.

FOR FURTHER INFORMATION about this model, or for expert engineering assistance with any industrial marking problem, see your nearest  representative, or write direct.

**IF IT'S WORTH MAKING,
IT'S WORTH MARKING.**

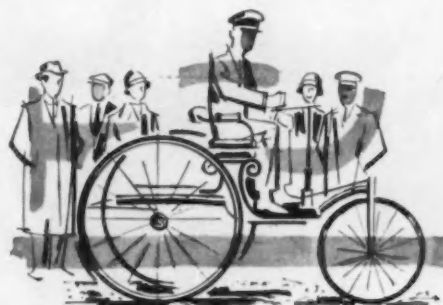
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by Benz



1955 — The first creative-packaging of dry-charged batteries was introduced by GLOBE

Historians disagree on the absolute birth-day of modern motoring, but Karl Benz did build the first internal-combustion engine car. And there's no argument at all about Globe's *battery* contributions . . . not only pioneering dry-charged batteries, but first to package all elements *together* for the simplest, swiftest battery activation ever known.

It's this fast, this easy, this important . .



Open the compact carton, a complete package of charging ingredients • Take out each plastic bottle of *pre-measured* Spinning Power electrolyte — no waste, no guesswork, no time out to measure • For extra safety slip each bottle into the handy pouring sleeve • Your grip is firm as you snip the bottle nipple and — *Pour!* Battery is ready for action with *fresh power*. Because until that instant the battery has been inert — and because *method and ingredients are all together in one package*.

Another milestone in power — another *first* for Globe!

First for fast, low-cost delivery too!

Lightweight plastic electrolyte bottles and compact carton cut shipping costs. Furthermore, Globe's sixteen plants are strategically located for fastest, lowest-cost shipments to all markets — and thirteen (*) are producing dry-charged batteries.

*ATLANTA, GA., *DALLAS, TEXAS, *EMPORIA, KANSAS,
*HOUSTON, TEXAS, *LOUISVILLE, KY., *MEDFORD, MASS.,
*MEMPHIS, TENN., *MILWAUKEE, WIS., *MINERAL RIDGE, OHIO,
*PHILADELPHIA, PA., *REIDSVILLE, NO. CAROLINA, *SAN JOSE,
CALIF., *HASTINGS-ON-HUDSON, N. Y., LOS ANGELES, CALIF.,
OREGON CITY, ORE., AJAX (ONTARIO) CANADA



GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

If it's Petroleum-powered there's a **GLOBE-BUILT BATTERY** right from the start!



Tongue support part for New Holland baler, prepared with 75-ton Warco inclinable punch press, is shown fitted in place on Hayliner 68 assembly line at New Holland, Pa. Inspecting the job is Sub-assembly Foreman Lee Larkin.

"Warco PRESSES

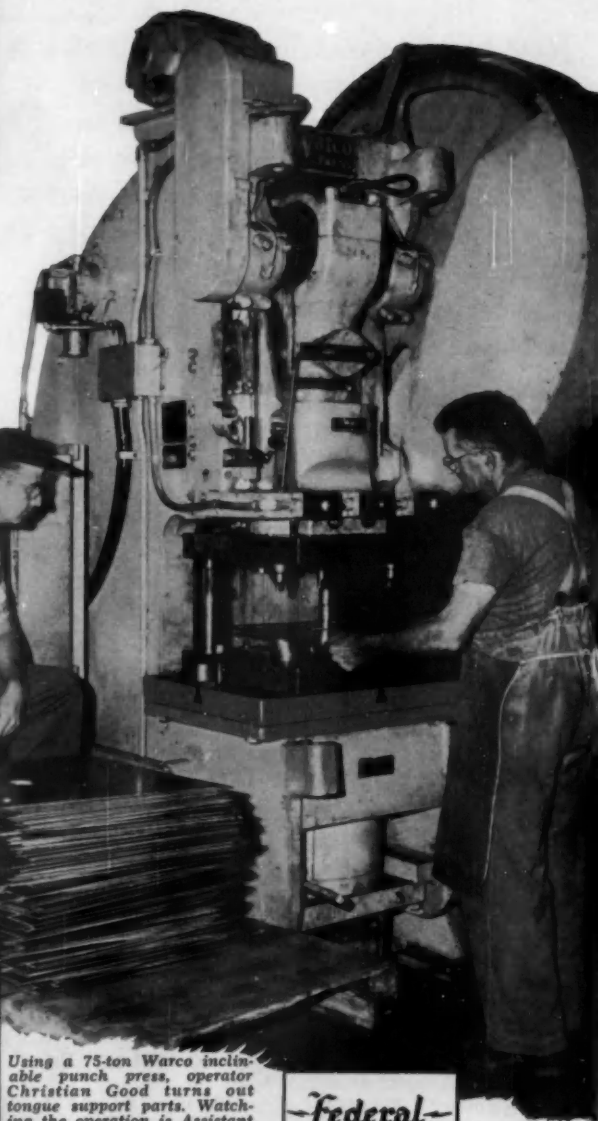
...Stand up!"

"Not a breakdown in five years," says leading farm machine manufacturer

• Several years ago New Holland Machine Company, New Holland, Pa., purchased their first Warco Press . . . an inclinable punch press. It is still working as good as the day they bought it. Since then they have added other Warcos for piercing, blanking and forming a variety of machine parts. "We find these presses very satisfactory," say New Holland officials; "in our five years of using Warcos we have never had a breakdown."

Warco Presses stand up because they are built from the frame out to deliver maximum performance in the most difficult assignments.

THE FINISHED PRODUCT . . . Warco inclinable punch press had a hand in turning out this smart-looking, smooth-performing Hayliner 68 baler. The machine was designed to bring the average-size farm big baling capacity at smaller baler cost.



Using a 75-ton Warco inclinable punch press, operator Christian Good turns out tongue support parts. Watching the operation is Assistant Foreman Lester Howe. Ten-gauge hot-rolled sheet steel is used for the part.

Federal
WELDERS

The Federal Machine and Welder Company

WARREN, OHIO

Warco
PRESSES®

Greater visibility, less glare
with
GUIDE "VIEW-FINDER" MIRROR!



Night or Day, a flick of your
finger Automatically places
mirror in
correct viewing position!



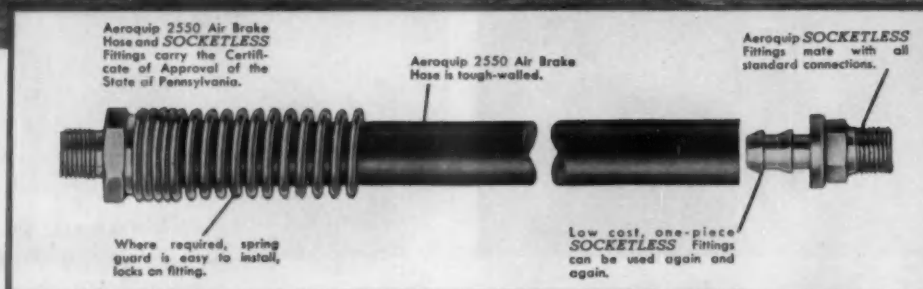
Night or day, a flick of your finger, the glare's gone—the view remains! At night, with Guide's new "View-Finder" mirror, you place the tab on "Night"—*automatically* you have clear, comfortable nighttime vision! No more blinding headlight reflection from traffic behind you! Daytime, place the tab on "Day"—you have a full, undistorted view of the road behind! And that's only part of the "View-Finder" mirror's beauty! Compact new stainless steel design takes less windshield space, still provides same wide-view mirror area. This adds nearly ten per cent more forward visibility, which means greater safety and convenience for you. The Guide "View-Finder" rear view mirror is available now, at General Motors dealers.

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GUIDE LAMP DIVISION • GENERAL MOTORS CORPORATION • ANDERSON, INDIANA



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CUTS MANUFACTURERS' COSTS!

Featuring exceptionally low cost, Aeroquip's new 2550 Air Brake Hose with Reusable **SOCKETLESS** Fittings save important money for manufacturers of trucks, buses, and air brake systems. For safety, top quality standards are maintained. Aeroquip Air Brake Hose Lines meet applicable S.A.E. specifications and carry the Certificate of Approval of the Pennsylvania Bureau of Highways.

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ment lines can be made quickly, in the shop or on the road, by cutting 2550 Hose to required length and pushing it on the **SOCKETLESS** Fittings by hand. The hose stays on. No clamps, bolts, or lugs are needed.

Write today for technical bulletin IEB-19 on 2550 Hose with **SOCKETLESS** Fittings, plus adapters and gladhands. See our catalog pages in Sweet's Product Design File, Section 6d. Engineering assistance available to manufacturers. Write for information.

SOCKETLESS is an Aeroquip Trademark


REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

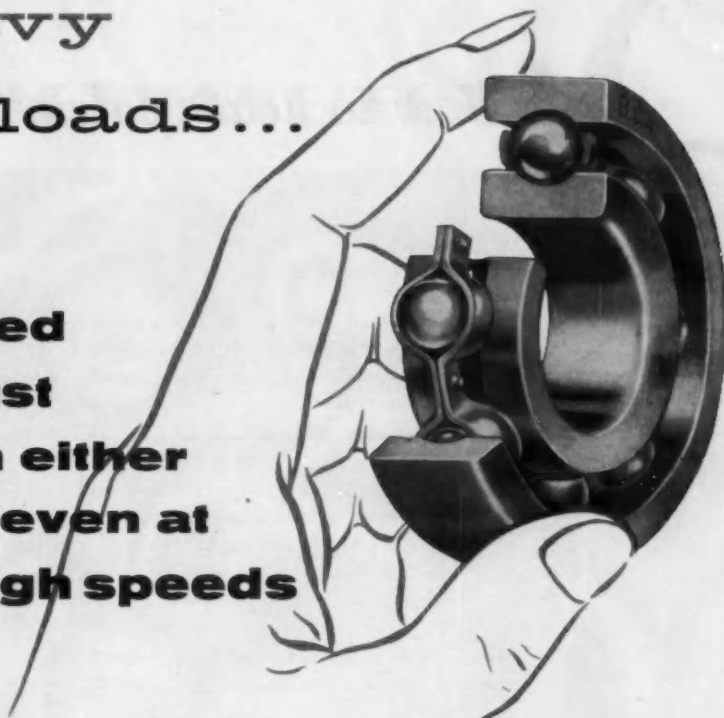
IN CANADA: AEROQUIP (CANADA) LTD., TORONTO 10, ONTARIO

SOCKETLESS Fitting Patents: Great Britain 740,428; France 1,088,423; Austria 185,178—Patents pending in U.S.A., Canada, and other countries.

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

for heavy
radial loads...

or combined
radial-thrust
loads from either
direction - even at
extreme high speeds



ENGINEERS: Send for a copy of BCA's valuable 100-page "Engineering Handbook." Write on your company letterhead. It's free!

single row, deep groove radial bearings

Precision-designed to sustain heavy radial loads or combined radial-thrust loads, these versatile BCA Conrad type ball bearings are built to the highest standards of material and workmanship.

Large size balls give the optimum ratio of ball diameter to bearing race section at the heaviest stressed points. Deep grooved, "high shouldered" raceways permit the bearing to carry heavy thrust loads in either direction equal to 100% of the radial load rating—even at extreme speeds.

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DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC.
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Q: Chilly day at Thule (-50°F.) . . . how to start fire-crash truck within seconds, provide 90,000 Btu/hr. in small space?

A: Janitrol liquid heater (tested to -65°F.) keeps engine ready to go, provides cab and cargo heating too!



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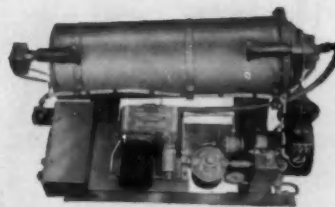


A

A: Call on Janitrol. If there's a need for heat for the job anywhere, chances are Janitrol can supply it, or build it from service-proved components.

Ever since designing and manufacturing the first successful heaters for aircraft 14 years ago, Janitrol has built thousands of heaters for aircraft and ground vehicles.

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The Janitrol logo, featuring the word "Janitrol" in a stylized, italicized font, with a small globe icon above the letter "i".

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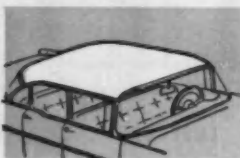
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ALLIED CHEMICAL & DYE CORPORATION
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*Trademark name for National Aniline's Diisocyanates




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filing of accurate contours*

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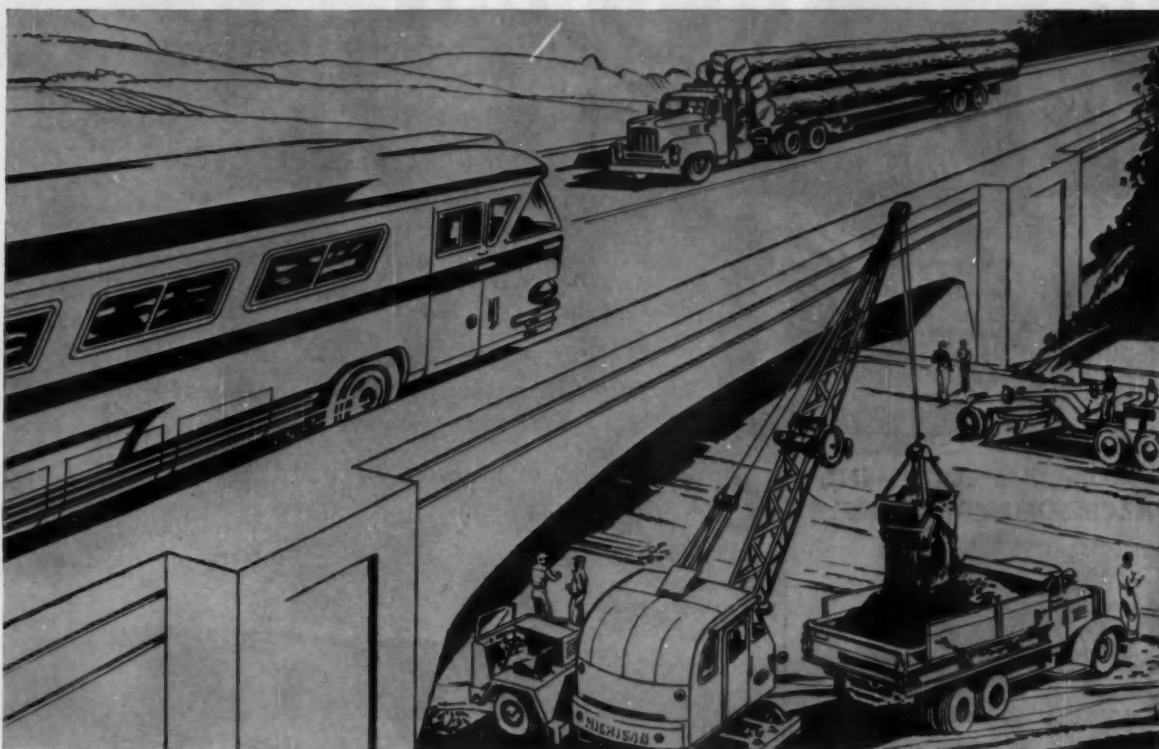
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300 V—Nominal torque rating 350 lbs-ft

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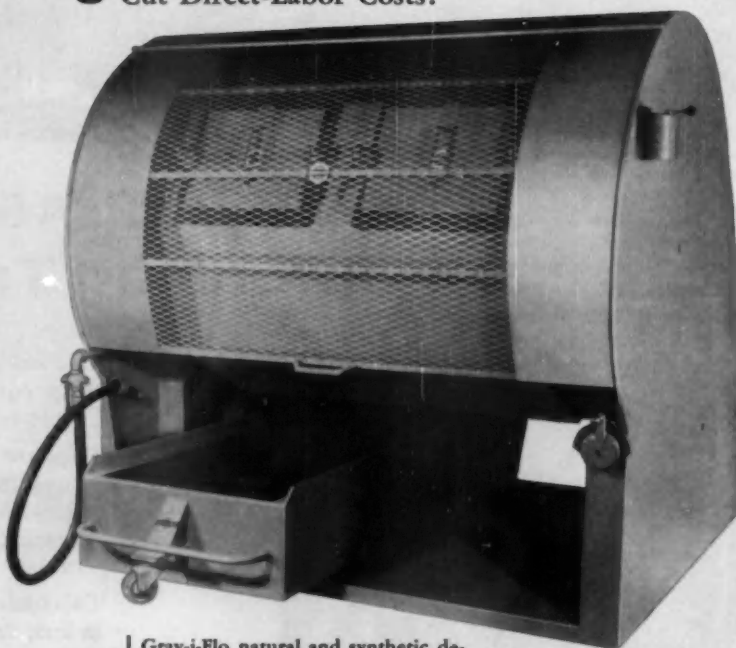


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☐ Send complete catalog. ☐ Have Sales Engineer call. ☐ We are sending samples.

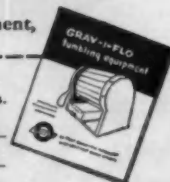
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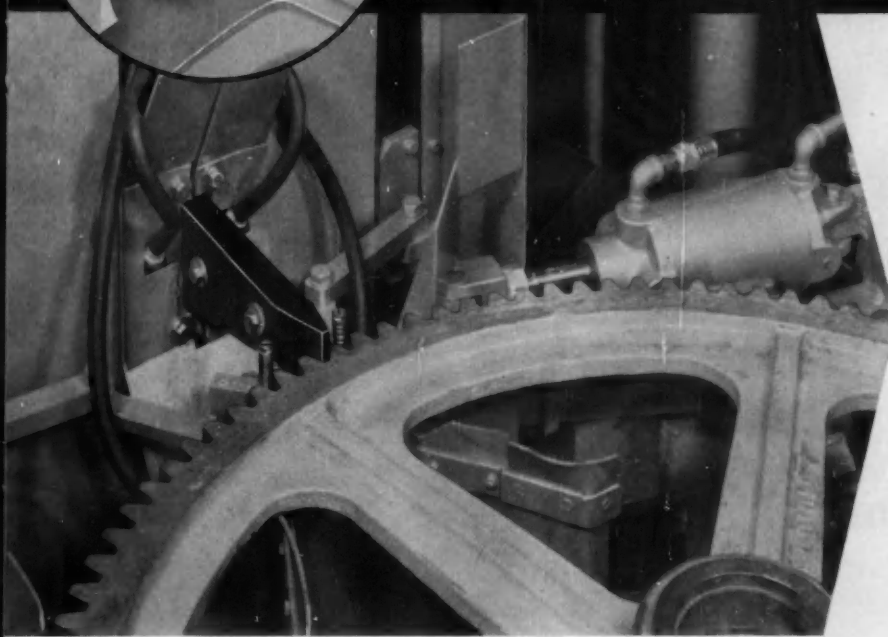


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Prompt response to your inquiry — Magnethermic, Youngstown, Ohio.

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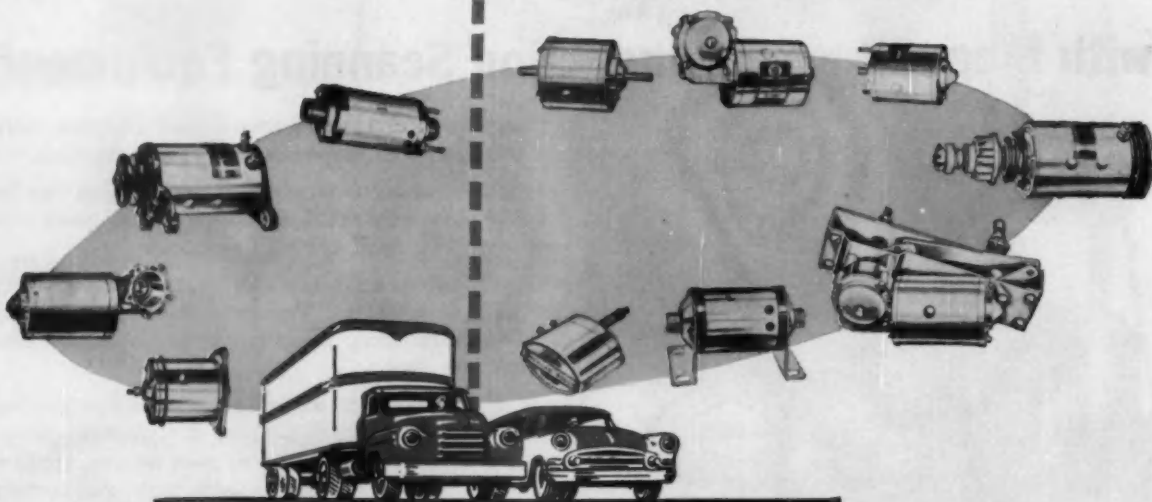
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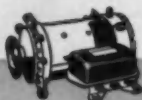
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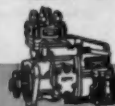
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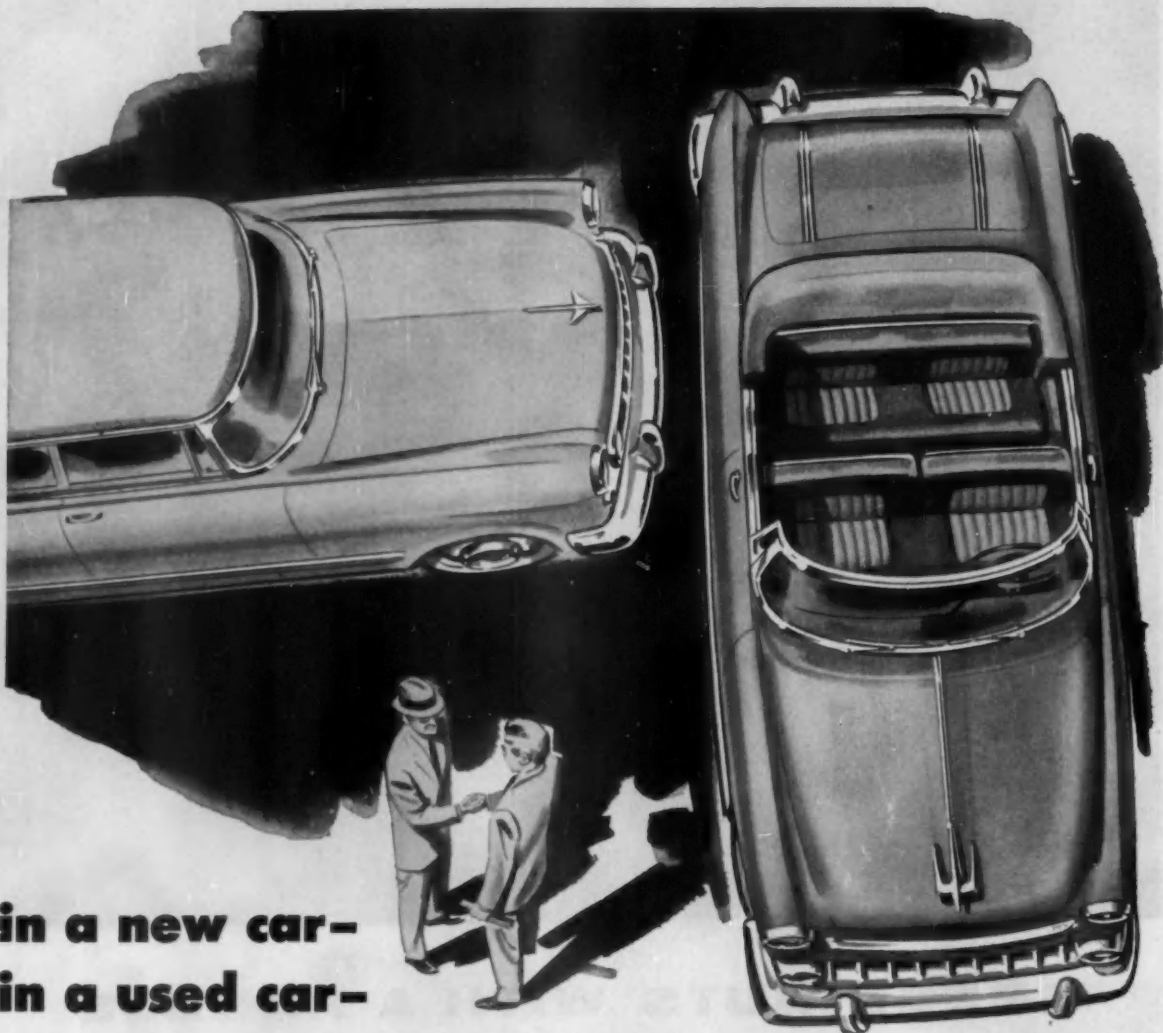
This is an example of the versatility of SPEED NUTS. It is also an example of the assembly advantages of SPEED NUT brand fasteners. Over 8000 types give you an answer to almost every

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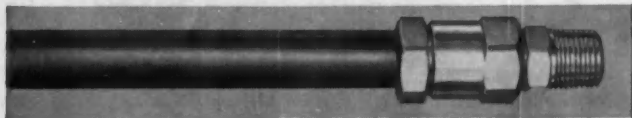
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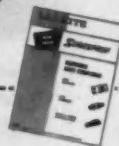
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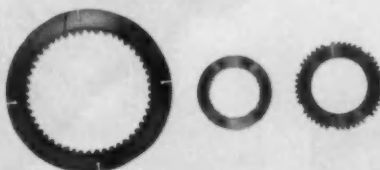


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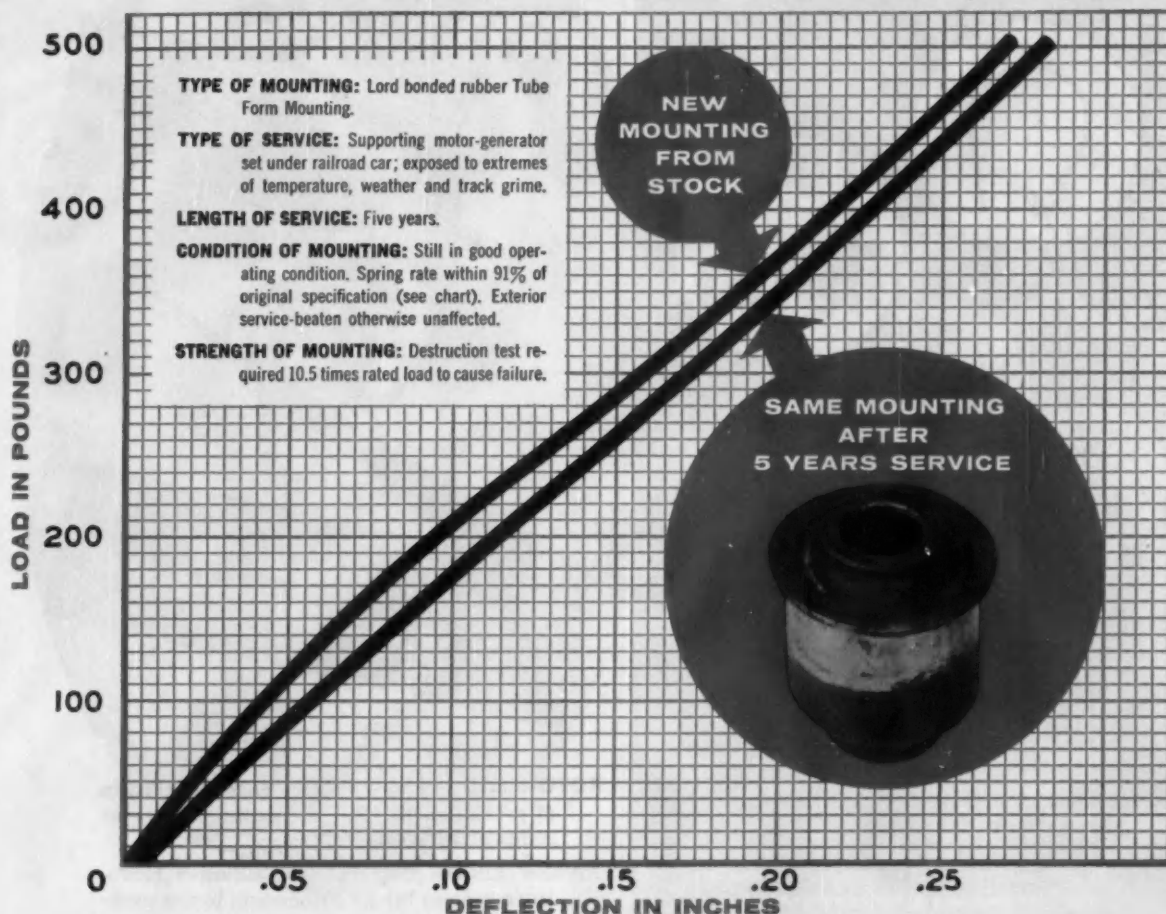
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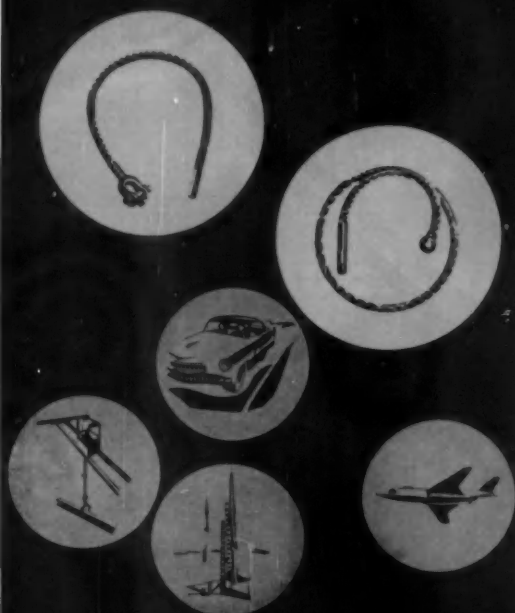
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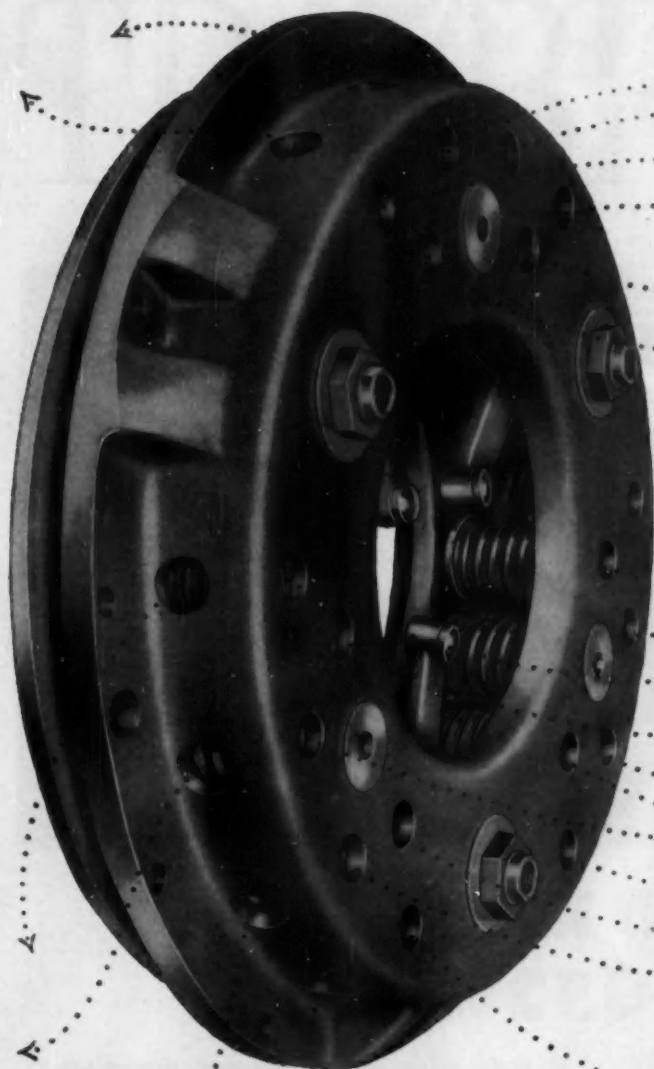
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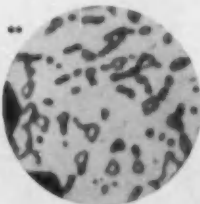
**HTM metal, liquid quenched, x2000, etched

Perhaps your product takes a severe beating—like rocker arms, for instance. Then you're interested in fatigue resistance under elevated temperatures. And that's where HTM castings really score.

But HTM castings don't stop there. Other major advantages of HTM metal are high fluidity that casts easily into complicated shapes... high ultimate strength... excellent non-seizing properties... *machinability index* of 80-90 (B1112 steel = 100).

Look into the advantages of HTM metal. It can improve the service performance—and sales performance—of your product.

AA-3099



NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Established 1868

Cleveland 6, Ohio

The nation's largest independent producer of malleable and pearlitic malleable

TDA[®] BRAKES

if it moves... we can stop it!

equal forward and reverse torque output

Both shoes are applied evenly with equal force and stopping action through a single, straight bore wheel cylinder.

only 8 different parts,

exclusive of wheel cylinder, the superior "DH" brake design reduces parts inventory and simplifies maintenance... actually 40% fewer parts than most competitive designs.



"DH" DUPLEX HYDRAULIC BALANCED BRAKE

Designed for heavy-duty service, greater safety, immediate response, less maintenance and easier servicing are all a part of this rugged new hydraulic brake.

Highly efficient, the "DH" brake is basically a self-energizing two-shoe brake in which both shoes do an equal share of the work... and are applied to the brake drum with equal effectiveness in both forward and reverse directions. Floating shoe design eliminates heel and toe clearance problems.

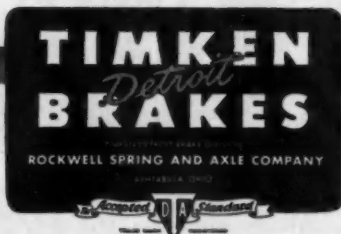
Far simpler, the "DH" brake has actually 40% fewer parts than most competitive designs. This results in smaller parts inventory and easier servicing.

The "DH" brake has already met overwhelming acceptance from many leading manufacturers and operators for its efficiency and design advantages.

"DH" Series Hydraulic Brakes are available in a broad range of capacities and sizes... to meet a variety of operating needs.

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For every industrial, agricultural or automotive application where braking is required!



TDA plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

Timken-Detroit Brake Division
Rockwell Spring & Axle Company
Dept. AI-27, Ashtabula, Ohio

Please send me further information on your "DH" brake.

Name _____ POSITION _____

Company _____

Address _____

City _____ State _____



DOES YOUR AUTO HAVE A STAINLESS REPUTATION?

Today it's not a question of whether the auto is here to stay, but rather how long it stays free of those unhappy, premature signs of age — corrosion and pitting . . . scratches and dents.

More and more, stainless steel is replacing other metals and alloys not only for trim but also for parts operating under critical conditions of temperature and corrosion. There's ample reason. For gleaming, durable stainless helps assure both beauty and serviceability *for the life of the car*. That's not only an added *initial sales advantage* . . . it means, too, that cars bring more in *re-sale* — an important point in today's competitive market.

People like stainless. It's the "friendly" alloy that comes clean and bright with soap and water . . . smiles at the roughest weather . . . and at fumes, salt, road chemicals . . . resists abrasion and dents. The finest stainless steels are made with Vancoram Ferro Alloys.

For better sales today — and tomorrow — *make it better, make it stainless!* Your supplier has the details. Call him.



VANADIUM CORPORATION OF AMERICA

420 Lexington Ave., New York 17, N.Y. • Chicago • Cleveland • Detroit • Pittsburgh

Producers of alloys, metals and chemicals



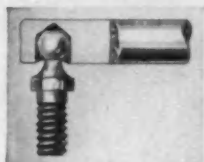
IMPROVED BALL JOINT DESIGNS

The five Tourek-designed Ball Joints illustrated below were developed for special applications and large volume production. Continued research by our engineers assures constantly improved Ball Joint designs. The superiority of TOUREK "STANDARD" Ball Joints results from the accumulated experience of more than 37 years of development and manufacturing.



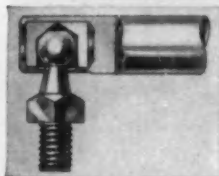
TOUREK OVERTRAVEL BALL JOINTS

Tourek Overtravel Ball Joints are designed to suit your application. This is not a stocked item due to such variations as spring travel, overall length, and spring tension. The tapped hole may vary to allow adjustment. If you have an application that requires an Overtravel, our Engineering department will welcome the opportunity of working with you.



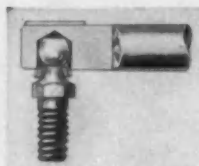
TOUREK TYPE "F" BALL JOINTS

Simplicity of Tourek Type "F" offers a very low cost Ball Joint which can be adapted to various rod or shell sizes. Recommended where side motion will not exceed 15 degrees in either direction. This assembly is supplied with hardened ball screw; shell wear surface may be hardened if so desired.



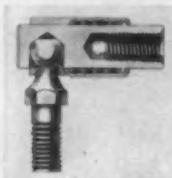
TOUREK TYPE "K" BALL JOINTS

Tourek Type "K" Ball Joints offer hardened wear surfaces, yet can be adapted to various rod or shell sizes. A very functional design at a minimum cost. Recommended for applications where side motion is restricted.



SNAP-ON BALL JOINT..CLIP TYPE

Tourek "Snap-on" Ball Joints—Clip Type used in the automotive field for years, permit removal of ball screw for quick length adjustment; also for engagement of shell or rod on pre-assembled ball screw. This unit can be adapted to various rod lengths and shells; ball screw is supplied hardened with soft or hardened shell.



SNAP-ON BALL JOINT..SLEEVE TYPE

A precision-made Ball Joint designed for a free assembly in those "hard-to-get-at places" or where adjustment of rod length must be made. A slight retraction of the outer shell exposes the socket for quick insertion or withdrawal of the ball. Releasing the spring loaded shell returns it to normal operating position.

No pressure is placed on the ball surface thereby permitting a free movement with maximum .004" end play. A minimum 15° movement in any direction obtained in standard design—for special application side motion may be restricted.

Snap-on Ball Joints—Sleeve Type—can be supplied to accommodate thread range from #10 to 3/4". Ball and socket wear surface can be supplied hardened.



**MAIL THE
COUPON
TODAY!**

World's largest manufacturer of "STANDARD" Ball Joints. Also makers of Pipe Plugs and quality Screw Machine Products. Range up to 2 3/4" diameter single and multiple spindle machines. Operations include: Threading • Tapping • Milling • Drilling • Grinding • Polishing • Plating • Heat Treating • Silver Soldering.

ESTAB.

1920

J. J. TOUREK MANUFACTURING COMPANY
1901 SOUTH KILBOURN AVENUE, CHICAGO 23, ILLINOIS

Gentlemen:

Please mail to me at once, complete information and prices on TOUREK "STANDARD" Ball Joints.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____



**WORLD'S LARGEST
Mechanical
Double Action
Press
by**



The huge press illustrated above marks a milestone in press development . . . the largest mechanical double action press in the world.

Vital Statistics—Rated capacity is 2500 tons. Weight is in excess of 1,000,000 pounds. Height is in excess of 38 feet. Bed and ram measure 90" (F-B) x 208" (R-L). The press operates at seven strokes per minute.

Just another big press? No, but this unique press is just another example of Verson's advanced concepts of press design and engineering. Whatever your press requirements, these concepts assure you of more press for your money . . . more profitable production in your plant. For specific recommendations, send an outline of your requirements.

VERSON ALLSTEEL PRESS CO.

9307 S. Kenwood Ave., Chicago 19, Illinois • 8300 S. Central Expressway, Dallas, Texas

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TOOLING •
CUSHIONS • VERNON-WHEELON DIRECT ACTING HYDRAULIC PRESSES



BRUSHING METHODS *worthy of your confidence*



BEFORE BRUSHING



AFTER BRUSHING



*At the push of a button.
Osborn Master® Wheels remove
burrs and blend surface junctures.
Costs are down 74% from
previous hand method.*


**Push-button
finish...
1400 per hour**

THE manufacturer of this machined aluminum ammunition component was faced with the necessity for attaining a high production rate, and at the same time, meeting the standards of rigid quality control.

Working closely with the Osborn representative, he built the rotating fixture shown above. Three Osborn Master® Wheels quickly remove feather burrs, blend surface junctures. Uniformly finished parts come through at the rate of 1400 per hour.

Osborn offers its services to you without obligation. A qualified Osborn Brushing Analyst is available wherever industry centers. He will welcome the opportunity to work with you. Write *The Osborn Manufacturing Company, Dept. E-49 5401 Hamilton Avenue, Cleveland 14, Ohio.*

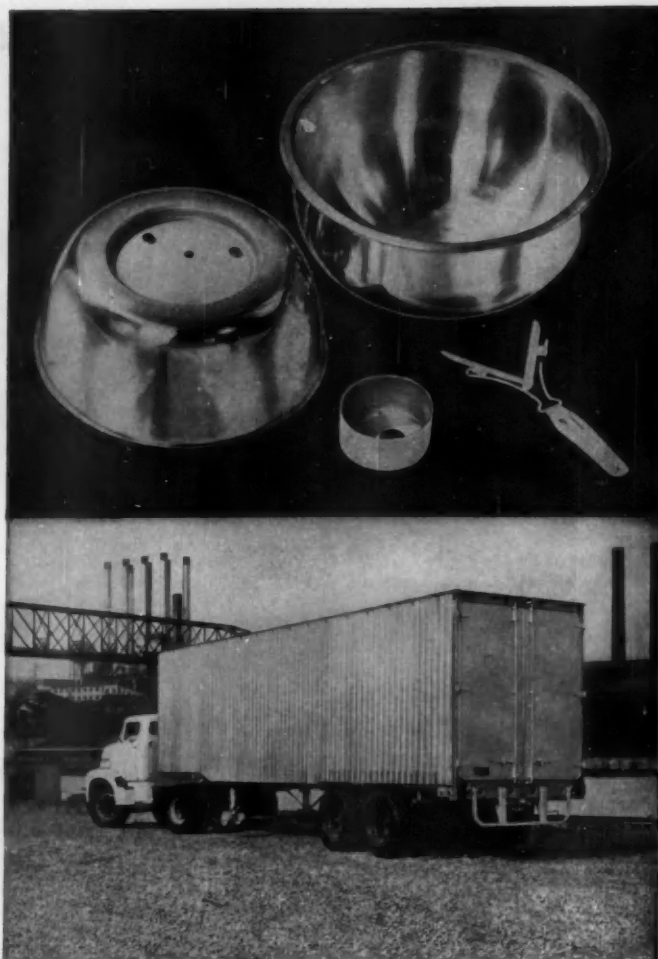
Write TODAY for
the new
100-page Osborn
Catalog 210-C.

Osborn Brushes 

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

You can draw
and form them
LITTLE

or fabricate them
BIG



with the new A-L low-nickel STAINLESS GRADES

WRITE FOR THE ASSISTANCE YOU NEED

1. "TECHNICAL STUDIES #3"

... essential information on the composition, properties, fabricating methods and applications of AL chromium-manganese, low-nickel stainless steels. *Write for your copy.*

2. TEST SAMPLES

... We'll be glad to supply engineering assistance, and actual samples of these 200-Series steels for testing under your processes and conditions.

ADDRESS DEPT. AI-86

In the top photograph, the fabrications you see are a mixing bowl, a tea-kettle base, a lock case and a patented shoe fastener: all made of A-L Type 201 or 202 chrome-manganese low-nickel stainless. The finish is good, the steel handled the same in the presses as Types 301 or 302, and similar drawing, buffing and polishing procedures were followed.

As in the lower illustration, the chrome-manganese low-nickel grades are being used also for fabrications as large as truck trailers and railroad coaches. Again, forming qualities and weldability present

no problems, and results are entirely satisfactory.

Sum it all up and this is the answer: you *won't* encounter any particular differences in fabricating the 200-series of stainless steels . . . you *will* find some advantage in price, and a very important factor of much greater availability in times of nickel shortage. • Why not take advantage of our pioneering experience with the low-nickel grades—let us help you use them. *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*

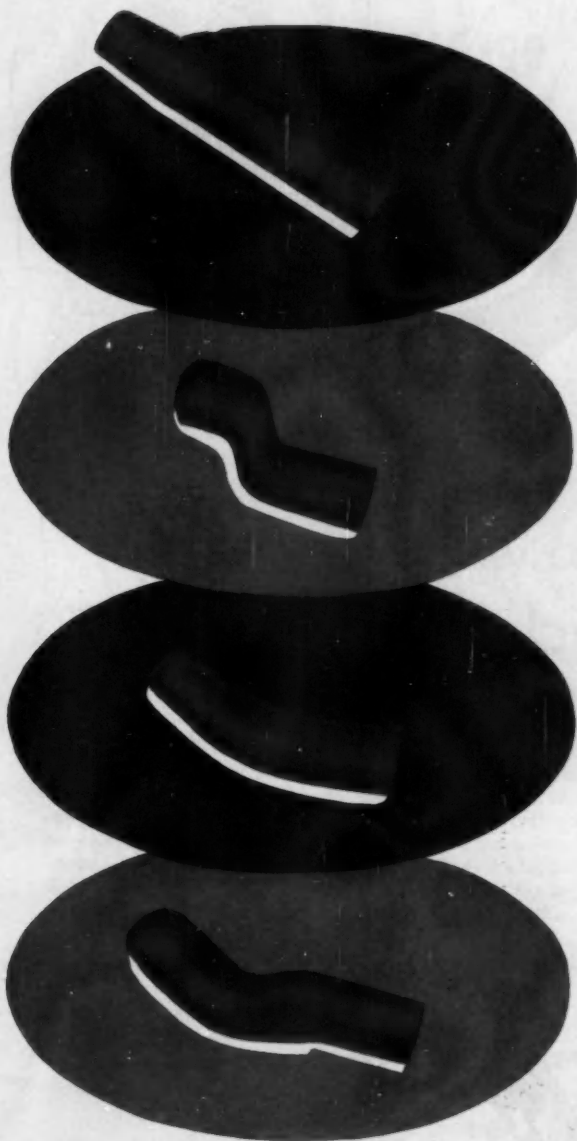
WSW 6080

For Stainless Steel in ALL Forms—call
Allegheny Ludlum

Warehouse stocks carried by all Ryerson Steel plants



If You Use Resistance Welding... **Take A Tip From Mallory**



Mallory resistance welding electrodes are available in the widest variety of stock sizes and shapes to be found anywhere. Many of the Mallory standards can actually eliminate the need for costly special electrodes. Constant Mallory research and pioneer background in the field of alloys continues to contribute increased life and better performance to a growing number of diversified users.

FAST DELIVERY is a product of a large and well rounded stock of standard electrodes. Mallory's diversified stock enables changeover and replacement units to be shipped to you on short notice.

LOWER COSTS are your benefit—brought about by the broad line of standard electrodes which often eliminate custom-built costs; and by Mallory's continuous effort to increase life and improve performance.

VERSATILITY of Mallory stock designs minimizes down time when machines are being converted to another service. Mallory's precision manufacturing holds dimensions to close tolerances, assuring complete interchangeability.

UNIFORM HIGH QUALITY of Mallory standard electrodes gives you performance dependability. You can count on Mallory for correct tapers, water tight connections, and smooth, symmetrical point forms. Every Mallory electrode is 100% inspected to insure consistently uniform, dependable service.

Write for your complete resistance welding catalog—**NOW.**

In Canada, made and sold by Johnson Matthey and Mallory, Ltd.
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Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
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Expect more ... get more from



For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



Always, at **SKF**, you will receive
unbiased advice

because

— All four basic types of anti-friction bearings are available from **SKF**.

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— They offer an extraordinarily wide range of sizes and combinations to meet virtually any requirement.

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— Their long experience in the widest variety of bearing applications is your assurance of receiving sound recommendations.

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— Thousands of manufacturers have been using the **SKF** Bearing Advisory Service for many years — always with good results. This dependable service is available to you, too.

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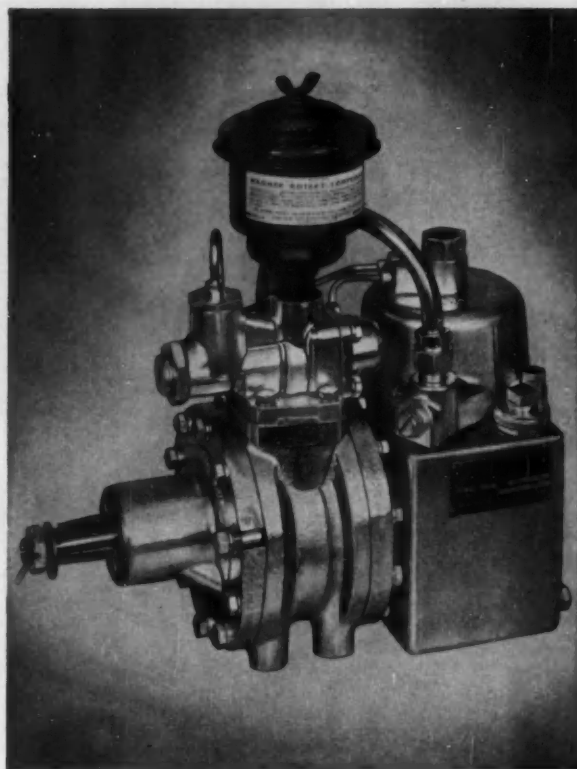
EVERY TYPE—EVERY USE

Ball Bearings
Cylindrical Roller Bearings
Spherical Roller Bearings
Tapered Roller Bearings (Tyson)

* Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

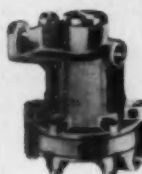
THE WAGNER ROTARY COMPRESSOR IS IMPORTANT IN MAKING WAGNER AIR BRAKES SAFE...EFFICIENT ...ECONOMICAL!



Actual field analysis shows that Wagner Rotary Air Compressors are safe—efficient—economical. They provide plenty of air for any emergency...have fast air recovery...and consistently keep service costs low because of exceptionally long life and easy, infrequent maintenance.

Wagner Rotary Air Compressors, available in either 9 or 12 C.F.M. capacity, air or water-cooled, are the heart of every Wagner Air Brake System. These Compressors are the only compressors that employ true rotary motion, with minimum friction loss. And because oil is separated and cooled before air is discharged, air temperature is reduced and formation of carbon, sludge and varnish in air lines is prevented.

It will pay you to include Wagner Air Brake Systems as standard equipment on the vehicles you manufacture. For complete information on Wagner "straight air" or "air-over-hydraulic" systems, send for your file copy of Wagner Bulletin KU-201.



WAGNER MOISTURE EJECTION VALVE

is one of many important Wagner Air Brake Components available to you. This fully automatic valve keeps air reservoir clean and dry.

Operating in the 15 to 20 p.s.i. air pressure range, it ejects moisture with each average brake application without causing a noticeable drop in tank pressure. May be mounted in any convenient location. No heating element is needed, as this valve cannot freeze in open (exhaust) position. Installation is quick and easy.

Wagner Electric Corporation 6363 PLYMOUTH AVENUE • ST. LOUIS 14, MO., U. S. A.

Wagner Air Brake Systems



LOCKHEED HYDRAULIC BRAKE PARTS and FLUID • NoRoL • CoMoX BRAKE LINING • AIR BRAKES • AIR HORNS • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES



ERIE RIGIDROP FORGES FASTER

NEW ALL-STEEL GRAVITY DROP HAMMER WITH VARIABLE STROKE CONTROL STRIKES MORE BLOWS PER MINUTE

One drop forge shop reports production increases averaging better than 10% with their RIGIDROP. No more waiting time in the handling cycle with Rigidrop's increased forging speed—the direct result of greater piston area per hammer rating, plus Rigidrop's variable stroke control.

OTHER RIGIDROP FEATURES:

- All-steel construction for long life
- 40% more guide surface
- Adjustable guides
- Safety design throughout
- Built-in inching mechanism
- Better clamping system
- Minimum down time

1500 through 5000 lbs.



You are invited—This 3000-lb. RIGIDROP can be inspected at the Erie Foundry factory. You are invited to come to Erie and operate this hammer—see for yourself how the new RIGIDROP with variable stroke control can forge faster. Call or write James A. Currie, president, for an appointment.

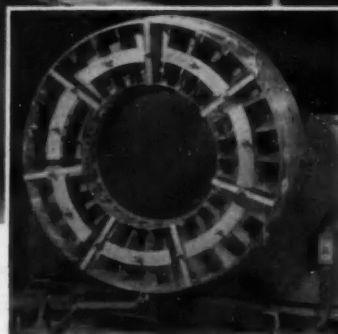
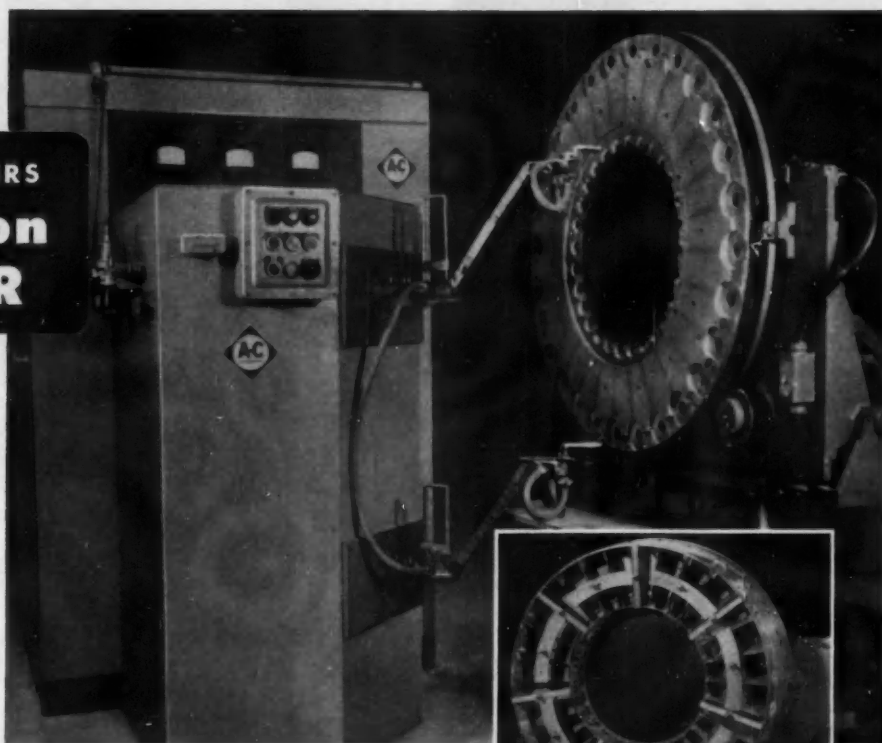
ERIE FOUNDRY CO. ERIE 5, PA.

SINCE 1895—THE GREATEST NAME IN FORGING MACHINERY

RHEEM MANUFACTURING COMPANY

Precision Brazes at Jet Speeds

ALLIS-CHALMERS
**Induction
HEATER**



**Each FACSIMILE Weldment of Vanes
in Inlet Guide Assembly for J-57
Engine Completed in Seconds**



**Mr. Hi Frequency is Ready
and Able to Help You, Too**

If your job is one of brazing, soldering, hardening, annealing, or heating, it will pay you to get all the facts on induction heating. Contact your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

UTILIZING an Allis-Chalmers 25-kw induction heater, and an A-C designed work fixture, Rheem has a brazing setup as streamlined as the jet planes they help build. Rheem's production speed is particularly significant in that it is accomplished in the face of stringent precision requirements, demanding accurately controlled localized heating. Close tolerances are a requirement. Yet the Allis-Chalmers induction heater, brazing at high speed, produces facsimile weldments — each as smooth and perfect as the next.

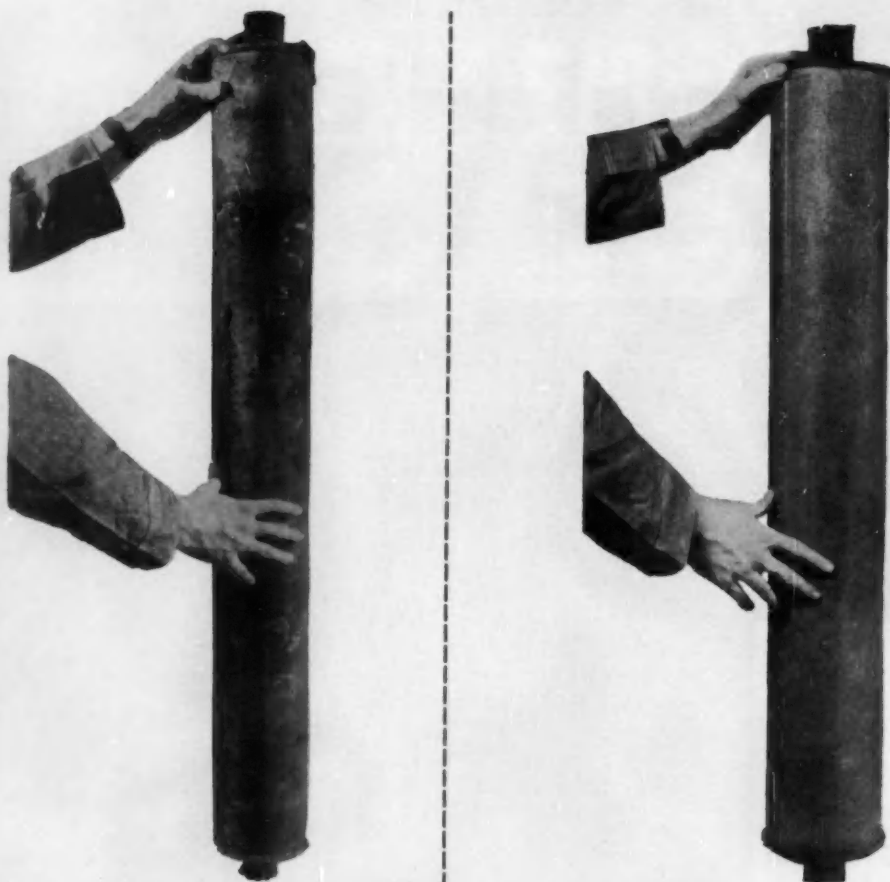
Specify A-C — Here's Why

The use of high frequency power makes Allis-Chalmers induction heating as much as seven times faster than conventional heating methods. Properly designed work handling equipment also speeds production. An automatic timer and other controls, standard on Allis-Chalmers units, promote precision operation. Allis-Chalmers extras — extensive laboratory facilities, unparalleled application experience, factory supervised installation — guarantee complete dependability . . . continuous service.



A-5295

ALLIS-CHALMERS



The cold-rolled steel muffler at left had to be replaced after only 18 months' service. Muffler at right, made of Armco ALUMINIZED STEEL Type 1, was still giving good service after 55 months.

Armco ALUMINIZED STEEL Doubles Average Muffler Life

Now that early replacement of expensive dual exhaust systems is making the new car owner conscious of muffler service life, you gain a big sales advantage by making sure that your new cars are equipped with mufflers made of Armco ALUMINIZED STEEL Type 1.

Actual road tests extending over a period of seven years show that ALUMINIZED STEEL mufflers outlast ordinary cold-rolled steel mufflers *at least two to one.*

TEST DATA

1. Only 4.2 per cent of the ALUMINIZED STEEL test mufflers failed during the first 24 months of operation compared with 42 per cent of the original cold-rolled steel mufflers.
2. A total of 85 per cent of the cold-rolled steel mufflers failed in the shell; only 9 per cent of the ALUMINIZED STEEL test

mufflers failed in the shell.

3. Average life of the first 37 per cent of failures was: ALUMINIZED STEEL—42.6 months; cold-rolled steel—18.1 months.

CONCLUSIONS

The test results indicate that Armco ALUMINIZED STEEL in any muffler part increases not only the life of that part, but also the average life expectancy of the muffler as a whole. This is particularly true of an ALUMINIZED STEEL shell, the most vulnerable component.

ALUMINIZED STEEL in mufflers reduces early failures, helps build better dealer-customer relations, and brings the customer back when he's ready to trade. Just write us at the address below for information on Armco ALUMINIZED STEEL Type 1.

ARMCO STEEL CORPORATION

947 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION





Now — Cleveland provides a single source for all your socket screw requirements

Simplifies specification, cuts paper work, speeds delivery

CLEVELAND STANDARD SOCKET SCREW PRODUCTS UNIFIED THREADS—CLASS 3A FIT

Type	Standard Sizes (diam.)	Material
Socket head cap screws	#0 to 1½ in. (larger sizes avail.)	Alloy steel, heat treated or Nonmagnetic 18-8 stainless
Set screws (cup, half dog, flat, cone or oval points)	#0 to 1 in. (#0-#3, cup point only)	Alloy steel, heat treated or Nonmagnetic 18-8 stainless (to ½ in., cup point only)
Flat head socket cap screws	#4 to ½ in.	Alloy steel heat treated
Button head socket cap screws	#4 to ½ in.	same
Shoulder screws (stripper bolts)	¼ to ½ in.	same
Dowel pins	¼ to 1 in. (nominal size and .001 in. oversize for repair)	same
Pressure plugs	¼ to 1½ in. NPTF	same
Socket screw keys	.028 to 1 in. across flats; short or long arm	same

Cleveland has expanded its socket screw line to provide a single source for all your socket head needs.

At the same time, and in conjunction with opening its new plant, Cleveland is doubling its factory warehousing capacity. This, plus the latest materials handling equipment, will enable Cleveland distributors to get same-day shipment of your larger orders.

Included in the expanded Cleveland socket screw line are precision dowel pins. While not a socket head product, they are basic fasteners for the important tool and die industry, where they are closely associated with socket head cap screws and shoulder screws. We offer them as part of a complete service.

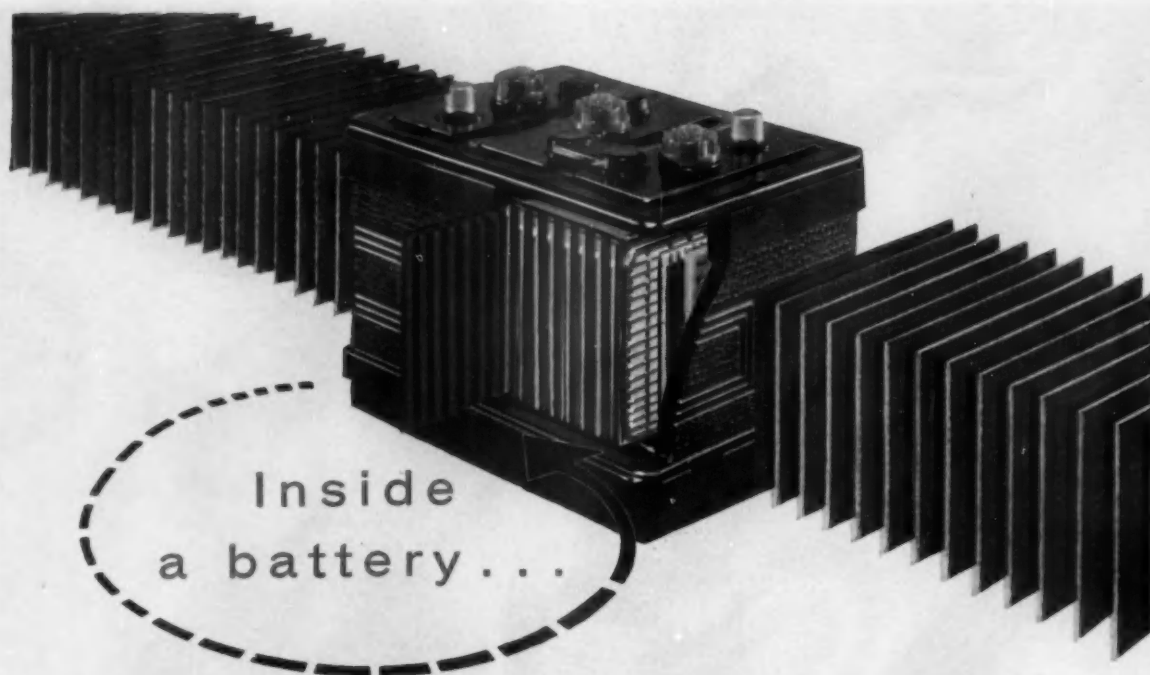
Cleveland socket head cap screws are upset forged from heat-treated alloy steel. This results in symmetrical, unbroken grain structure in heads, threads and fillets—greater fatigue and tensile strength, stronger fasteners.

Write for latest literature and technical data. Then see your local Cleveland Cap Screw distributor for all your socket screw requirements.

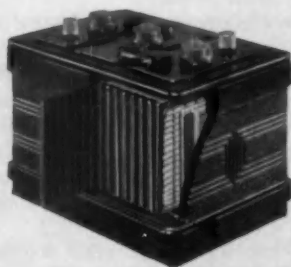


THE CLEVELAND CAP SCREW COMPANY

4444-10 Lee Road, Cleveland 28, Ohio



there are
42 reasons why
EVANITE separators help
 battery
 performance!



Plant: Coos Bay, Ore.
Sales Offices: Plymouth, Mich.;
 Coos Bay, Ore.; New York, N. Y.;
 Chicago, Ill.; Tampa, Fla.

In a battery with 42 Evanite separators, every one of those separators is a contributing factor in the battery's ability to meet the heavy electrical demands of today's cars. Evanite separators of wood fibre fortified with synthetic resin have high uniform porosity, very high acid resistance, superior wettability and permeability, low web thickness, outstanding mechanical strength and resistance to abrasion and oxidation. Controlled swelling after insertion makes a tight element which resists vibration. Low cost Evanite helps keep *your* costs down, too. Write today for Evanite samples. Evans Products Company, Dept. P-2, Plymouth, Michigan.

EVANITE

Evanite is a registered trademark of Evans Products Co.

EVANS PRODUCTS COMPANY also produces: Evaneer fir plywood; Evanite hardboard; fir lumber; railroad loading equipment; truck and bus heaters; Evans bicycles and velocipedes



Yoloy "E" Makes Lighter Trailers

Yoloy "E" containing nickel, copper and chromium, a Member of the Yoloy Family of Steels, having a longer life, greater strength and good weldability makes Trailer tanks more durable and stronger. This new style tank is brought about by the use of lighter gauges plus the elimination of certain structures formerly required, plus reshaping and reforming the skin. The result is a tank that is serviceable, strong yet lighter.

Write for these free pamphlets in The Yoloy Family series:

Yoloy "E"	High Strength Low Alloy Steel-standard applications
Yoloy	High Strength Low Alloy Steel-special applications
Yoloy "S"	Higher Strength Steel for increased service life
Yoloy "C"	Corrosion Resistant Grade for deep forming
Yoloy Pipe	Continuous Weld for corrosion resistant applications



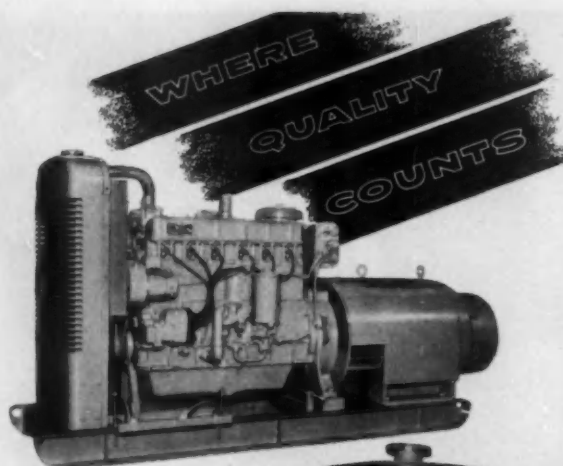
Independent Metal Products Div. of Fruehauf Trailer Co. produced (above) a new style 6250 gallon tank weighing approximately 1100 lbs. less than a 6000 gallon tank made of conventional steel and (right) a new style cement hauler saving as much as 300 lbs.



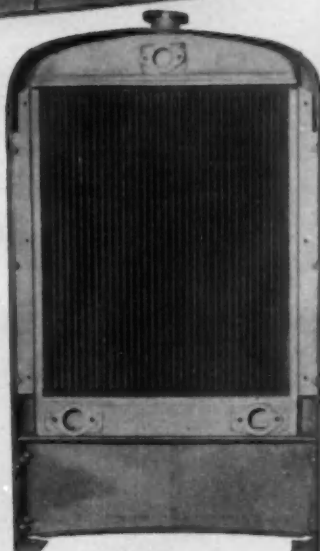
THE
Youngstown
SHEET AND TUBE COMPANY

General Offices - Youngstown 1, Ohio
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Producers of Quality Carbon and Alloy Steels for Over Half-a-Century



count
on
Young
radiators
to
cool
correctly



Whether their service is intended to be continuous or for standby emergency use the engine-generators made by United States Motors Corporation, of Oshkosh, Wis., are known far and wide to be extremely reliable. This reliability is based on years of manufacturing experience plus the use of top-grade purchased components — among them Young Radiators.

Young furnishes both radiator and shell and grill assembly to U.S. Motors for the 60 kw model shown as well as for other models. You'll find Young Radiators on many applications including engines from 2 HP up to installations rated in thousands of horsepower. Tractors, trucks, earthmovers, compressors, oil field equipment — for any heat transfer application where quality counts you'll find Young.

Young engineering talent has solved the heat transfer problems of others. How about calling on us to investigate yours? No obligations, of course.



Write Dept. 107-B
for FREE Catalog

Young RADIATOR COMPANY
RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY

Heat Transfer Products for Automotive, Heating, Cooling, Air Conditioning Products
Aviation and Industrial Applications, for Home and Industry.

Executive Offices: Racine, Wisconsin, Plants at Racine, Wisconsin, Maitland, Illinois



PAT. PENDING

Satisfaction Guaranteed Or Money Back TRIAL OFFER

TRU-O-SEAL Fittings are guaranteed to seal pipe thread connections permanently against all oils, practically all known chemicals and gases; to seal under high pressures or vacuum; to withstand —280° to plus 500° F.; to eliminate "overlightening" damage and pipe dope. Available in 1/8" to 2 1/2" pipe thread sizes.

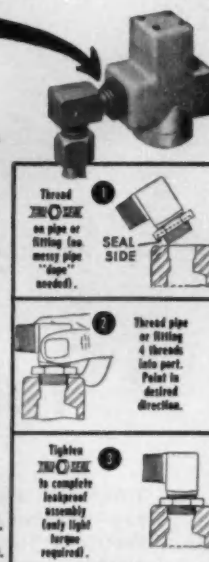
\$10.00 Trial Offer No. 1: eight 1/8", ten 1/4", eight 3/8", ten 1/2" pipe thread **TRU-O-SEAL** Fittings.

\$10.00 Trial Offer No. 2: eight 1/2", ten 3/4", four 1" pipe thread **TRU-O-SEAL** Fittings. Send order to

TRU-O-SEAL

DIVISION
Flick-Ready Corporation

2028 N. Hawthorne Melrose Park, Ill.
"Miller Fluid Power" is also a Div. of Flick-Ready Corp.



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Sturtevant TORQUE WRENCHES

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- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch grams
...inch ounces
...inch pounds
...foot pounds



Every manufacturer,
design and production
man should have this valu-
able data. Sent upon request.

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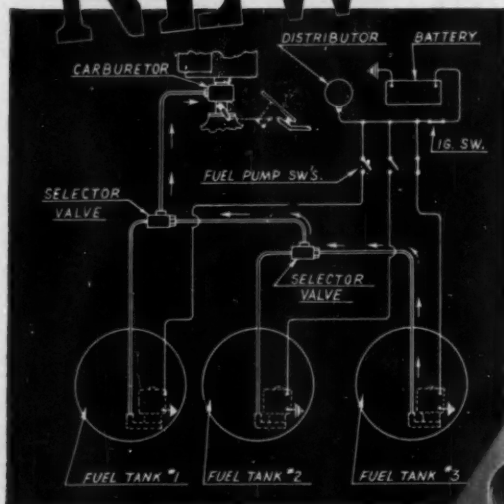
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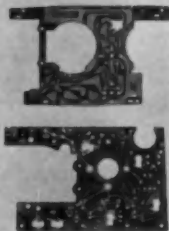
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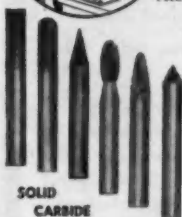
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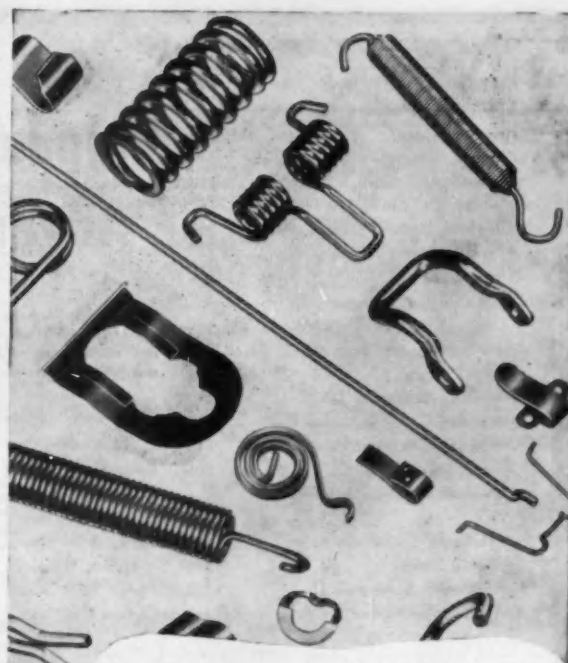
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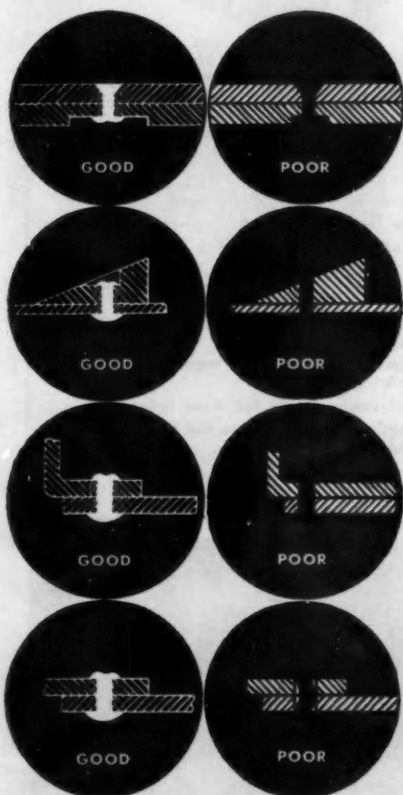
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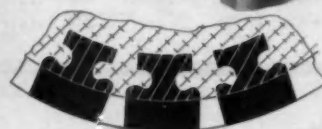


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